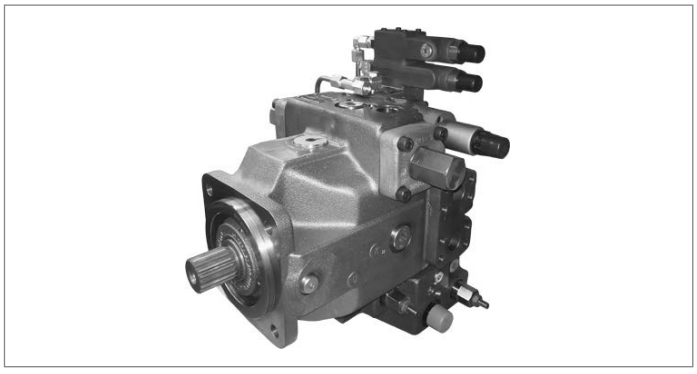
RE 92100-01-X-B2/2019.08.07
Replaces: 07.2018

rexroth
A Bosch Company

Axial piston variable pump A4VSG Series 10(11) and 30

for explosive areas II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X

Part II of instruction manual in accordance with ATEX Directive 2014/34/EU data sheet



- Size 40 ... 180
- Nominal pressure 350 bar
- Maximum pressure 400 bar
- Closed circuit

Information on explosion protection

- Application per Directive 2014/34/EU (ATEX)
- Gas: II 2G Ex h IIC T4-T1 Gb X according to DIN EN ISO 80079-36: 2016, DIN EN ISO 80079-37: 2016
- Gas: II 3G Ex h IIC T4-T1 Gc X according to DIN EN ISO 80079-36: 2016, DIN EN ISO 80079-37: 2016

Features of the ATEX version

The ATEX version is an advanced development of the A4VSG for compliance with Directive 2014/34/EU (ATEX). External features distinguishing it from the standard pump as according to DIN Data Sheet 92100 are the ground terminal, the Ex mark and the CE mark on the name plate.

Temperature classes per DIN EN ISO 80079-36

Depending on the two temperature classes, T3 and T4, observe the maximum permissible temperatures (see "Hydraulic fluid" and "Operating data monitoring – X parameters").

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Type code

01	02	03	04	05		06	07		08	09	10	11	12	13	14	15
	A4VS	**G**			**/**			**–**				**10**				

Hydraulic fluid — **40 ... 180**

01	Mineral oil (without code)	●	

Axial piston unit

02	Swashplate design, variable, nominal pressure 350 bar, maximum pressure 400 bar	**A4VS**

Operating mode

03	Pump, closed circuit	**G**

Size (NG)

04	For geometric displacement, see table of values page 9	**40**	**71**	**125**	**180**	

Control device		Data sheet					
05	Hydraulic control, pilot-pressure related	92080	●[2]	●[2]	●	●	**HD..**[1]
	Electrohydraulic control with proportional solenoid	92084	●[2]	●[2]	●	●	**EP**
	Manual control	92072	●	●	●	●	**MA**

Series		**40**	**71**	**125**	**180**	
06	Series 1, index 0 or 1	●	●	–	–	**10(11)**
	Series 3, index 0	–	–	●	●	**30**

Direction of rotation — **40 ... 180**

07	Viewed on drive shaft	clockwise	●	**R**
		counter-clockwise	●	**L**

Sealing material — **40 ... 180**

08	FKM (fluoroelastomer) and ATEX version II 2G Ex h IIC T4-T1 Gb X	●	**R**
	FKM (fluoroelastomer) and ATEX version II 3G Ex h IIC T4-T1 Gc X	●	**A**

Drive shaft — **40 ... 180**

09	Parallel keyed shaft DIN 6885	●	**P**
	Splined shaft DIN 5480	●	**Z**

● = Available ○ = On request – = Not available

Notices

- When ordering, please indicate the equipment group, category, explosion group, temperature class and type of protection required for your intended ATEX application.
- Potential equalization: The pump must be grounded. For: Grounding points, see drawings starting on page 17. Compared to the standard pump, the technical data is restricted in terms of temperature, case pressure and bearing flushing/installation position.
- To avoid mechanically generated sparks from aluminum contaminants with iron oxide and/or rust particles on the surface[3], the pump comes painted to protect against corrosion. Please contact your Rexroth partner for available colors.
- The service life of the bearings must be calculated. The load cycle forms the basis for this. Please contact us.

Please observe the project planning notes on page 44!
For information on storing and preserving axial piston units, see Data Sheet 90312.

- All attachment pumps must comply with the application-specific ATEX classification.

1) HD.U and HD.T not available in ATEX
2) Version with HD and EP-controls in series 11
3) See DIN EN ISO 80079-36, 6.4.2.1

Type code

01	02	03	04	05		06	07		08	09	10	11	12	13	14	15
	A4VS	**G**			**/**			**–**				**10**				

Mounting flange

			40 ... 180	
10	In accordance with ISO 3019-2 metric	4-hole	●	**B**

Working port

		40 ... 180	
11	SAE flange ports **A** and **B**, located on same side, metric fastening thread	●	**10**

Through drives (for mounting options, see page 39)

12	Flange **ISO 3019-2** (metric)		Hub for splined shaft					
	Diameter	Mounting[6]	Diameter		**40**	**71**	**125**	**180**
	125, 4-hole		32x22x14x9g[4]		●	●	●	●	**K31**
	140, 4-hole		40x2x18x9g[4]		–	●	●	●	**K33**
	160, -4-hole		50x2x24x9g[4]		–	–	●	●	**K34**
	80, 2-hole		3/4 in	11T 16/32DP[5]	○	●	●	○	**KB2**
	100, 2-hole		7/8 in	13T 16/32DP[5]	●	●	●	●	**KB3**
	100, 2-hole		1 in	15T 16/32DP[5]	○	●	●	●	**KB4**
	125, 2-hole		1 1/4 in	14T 12/24DP[5]	–	●	●	●	**KB5**
	160, 4-hole		1 1/4 in	14T 12/24DP[5]	○	○	○	○	**KB8**
	125, 2-hole		1 1/2 in	17T 12/24DP[5]	–	–	●	●	**KB6**
	180, 4-hole		1 1/2 in	17T 12/24DP[5]	–	–	○	○	**KB9**
	180, 4-hole		1 3/4 in	13T 8/16DP[5]	–	–	●	●	**KB7**
	Flange ISO **3019-1** (SAE)		Hub for splined shaft					
	Diameter	Mounting[6]	Diameter		**40**	**71**	**125**	**180**
	82-2 (A)		5/8 in	9T 16/32DP[5]	●	●	●	●	**K01**
	82-2 (A)		3/4 in	11T 16/32DP[5]	○	○	○	○	**K52**
	101-2 (B)		7/8 in	13T 16/32DP[5]	●	●	●	●	**K68**
	101-2 (B)		1 in	15T 16/32DP[5]	●	●	●	●	**K04**
	127-2 (C)		1 1/4 in	14T 12/24DP[5]	–	●	●	●	**K07**
	127-2 (C)		1 1/2 in	17T 12/24DP[5]	–	–	●	●	**K24**
	152-4 (D)		1 3/4 in	13T 8/16DP[5]	–	–	●	●	**K17**
	Prepared for through drive, with pressure-proof plugged cover				●	●	●	●	**K99**
	Boost pump							
	A piped attachment pump for the boost circuit				●	●	●	●	**H02**

● = Available ○ = On request – = Not available

4) According to DIN 5480
5) In accordance with ANSI B92.1a
6) Mounting holes pattern viewed on through drive with control at top.

Type code

01	02	03	04	05		06	07		08	09	10	11	12	13	14	15
	A4VS	**G**			**/**			**–**				**10**				

Valves		**40**	**71**	**125**	**180**	
13	Without valve block	●	●	●	●	**0**
	SDVB valve block mounted **16** (With directly controlled flushing slide and pilot operated high-pressure relief valve)	●	●	●	●	**4**

Filtration		**40**	**71**	**125**	**180**	
14	without filter	●	●	●	●	**N**

Special version (optional)		**40**	**71**	**125**	**180**	
15	Without special version	○	●	●	●	
	With double shaft seal	●	●	●	●	**-S1111**

● = Available ○ = On request – = Not available ▲ = Not for new projects

Features of the ATEX version

The ATEX version is an advanced development of the A4VSG for compliance with Directive 2014/34/EU (ATEX). External features distinguishing it from the standard pump 92100 are the ground terminal, the Ex marking and the CE marking on the name plate.

Temperature classes per DIN EN ISO 80079-36

Depending on the two temperature classes, T3 and T4, observe the maximum permissible temperatures (see "Hydraulic fluid" and "Operating data monitoring – X parameters").

Notices

- **ATEX classification:** When ordering, please indicate the equipment group, category, explosion group, temperature class and type of protection required for your intended ATEX application.
- **Technical data:** Compared to the standard pump, restrictions apply in terms of temperature, case pressure and bearing flushing/installation position.
- **Painting/color selection:** In order to avoid mechanically generated sparks from contaminants made of aluminum with iron oxide and/or particles of rust of the surface[1)], the pump is painted as standard with corrosion protecting. Please contact your Rexroth partner for available colors.
- **Bearing service life:** The service life of the bearings must be calculated. The load cycle forms the basis for this. Please contact us.
- **Potential equalization:** The pump must be grounded. For grounding points, see drawings starting on page 17.

Notices

- Please observe the project planning notes on page 44.
- In addition to the type code, please specify the relevant technical data when placing your order.
- For details of the mounting situation of combination pumps, see page 39.

1) See DIN EN ISO 80079-36, 6.4.2.1

Hydraulic fluids

The A4VSG variable pump is designed for operation with DIN 51524 HLP mineral oil.
See the following data sheets for application instructions and requirements for hydraulic fluids before the start of project planning:

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons

Information on the selection of hydraulic fluid
Selection of hydraulic fluid shall make sure that the operating viscosity in the operating temperature range is within the optimum range (v_{opt}; see selection diagram).

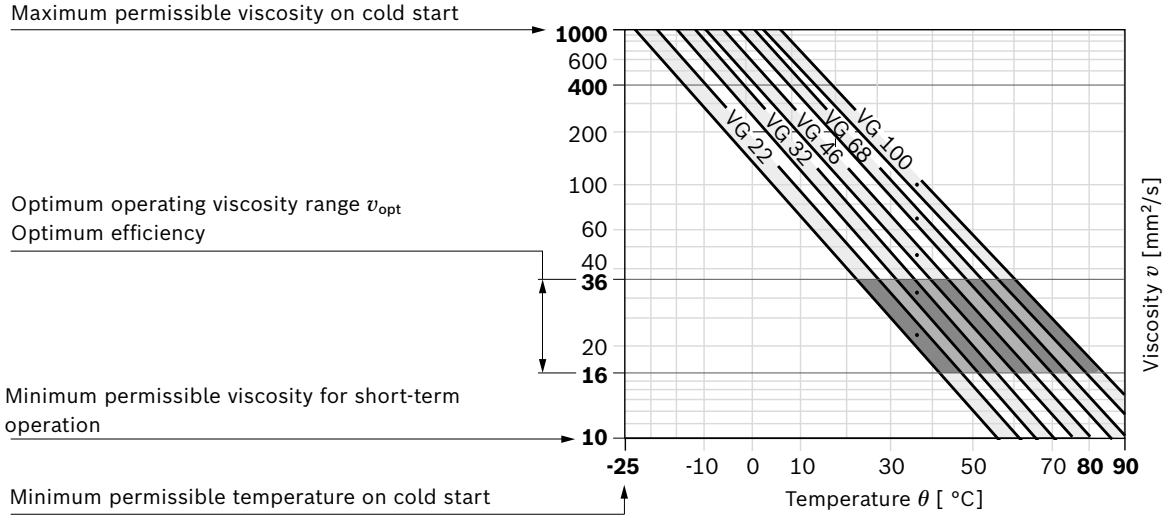
Temperature class T4 and T3 as to ATEX:
For safety instructions, see “Operating data monitoring – X parameters” on page 6.

Ignition temperature of hydraulic fluid
The pump is approved for temperature class T4 to T1 according to DIN EN ISO 80079-36.
Under DIN EN ISO 80079-37, only hydraulic fluids with an ignition temperature at least 50 K above the maximum surface temperature of the approved temperature class should be used. Example: For the temperature class T4, the ignition temperature of the hydraulic fluid should be ≥ 185 °C.

Viscosity and temperature of hydraulic fluids

	Viscosity	Temperature	Comment
Cold start	v_{max} ≤ 1600 mm²/s	θ_{St} ≥ -25 °C	t ≤ 3 min, without load p ≤ 50 bar Maximum permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K
Warm-up phase	v = 1600 to 400 mm²/s	θ ≥ -25 °C	For p_{nom}, 0.5 × n_{max} und t ≤ 15 min
Continuous operation	v = 400 to 10 mm²/s	**T3** θ = -25 °C to +90 °C **T4** θ = -25 °C to +80 °C	Measured at the drain port Observe the permissible temperature range of the shaft seal
	v_{opt} = 36 to 16 mm²/s		optimal operating viscosity and efficiency range
Short-term operation	v_{min} ≤ 10 mm²/s	**T3** θ = -25 °C to +90 °C **T4** θ = -25 °C to +80 °C	t < 3 min, p < 0.3 × p_{nom}

▼ **Selection diagram**



Operating data monitoring – X parameters

- Ambient temperature Ta: -20 °C to +50 °C

Safety instructions: Temperature class T3-T1
ATEX category II 3G Ex h IIC T3-T1 Gc X
To observe the **maximum leakage temperature of 90 °C**, at least one of the following measures must be taken and checked regularly:

- Check the leakage temperature at port **T** or **R**(**L**) (maximum distance 30 cm)
- Check the maximum inlet temperature of 60 °C at the suction port
- Check a maximum inlet temperature that must be determined for the following operating points when commissioning:
  - Maximum working pressure and maximum possible flow
  - Maximum working pressure and minimum flow

Also monitor the reservoir level. Take appropriate action if the temperature exceeds limits.

- Port $\mathbf{T_2}$ must be connected to the reservoir to relieve pressure on the double shaft seal.

ATEX category II 2G Ex h IIC T3-T1 Gb X
To observe the **maximum leakage temperature of 90 °C**, the following measures must be taken:

- Continuously monitor the leakage temperature at each pump with a temperature sensor on ports **T** or **R**(**L**) (maximum distance to port 30 cm).
- Connect the temperature sensor with a switching-off for the system at the limit temperature of 90 °C.
- This shut-off function should be tested during commissioning; see chapter 8.1.1 of the instruction manual.

Reservoir level monitoring is also required.

- Port $\mathbf{T_2}$ must be connected to the reservoir to relieve pressure on the double shaft seal.

Safety instructions: Temperature class T4
ATEX category II 3G Ex h IIC T4 Gc X
To observe the **maximum leakage temperature of 80 °C**, at least one of the following measures must be taken and checked regularly:

- Check the leakage temperature at port **T** or **R**(**L**) (maximum distance 30 cm)
- Check a maximum inlet temperature of 50 °C at the suction port
- Check a maximum inlet temperature that must be determined for the following operating points when commissioning:
  - Maximum working pressure and maxium possible flow
  - Maximum working pressure and minimum flow

Also monitor the reservoir level. Take appropriate action if the temperature exceeds limits.

- Port $\mathbf{T_2}$ must be connected to the reservoir to relieve pressure on the double shaft seal.

ATEX category II 2G Ex h IIC T4 Gb X
To observe the **maximum leakage temperature of 80 °C**, the following measures must be taken:

- Continuously monitor the leakage temperature at each pump with a temperature sensor on ports **T** or **R**(**L**) (maximum distance to port 30 cm).
- Connect the temperature sensor with a switching-off for the system at the limit temperature of 80 °C.
- This shut-off function should be tested during commissioning; see chapter 8.1.1 of the instruction manual.

Reservoir level monitoring is also required.

- Port $\mathbf{T_2}$ must be connected to the reservoir to relieve pressure on the double shaft seal.

For installation instructions, see page 41

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.
A cleanliness level of at least 20/18/15 under ISO 4406 should be maintained.
At a hydraulic fluid viscosity of less than 10 mm²/s (e.g. due to high temperatures during short-term operation) at the drain port, a cleanliness level of at least 19/17/14 under ISO 4406 is required.
For example, viscosity is 10 mm²/s at:

- HLP 32 a temperature of 73 °C
- HLP 46 a temperature of 85 °C

Bearing flushing

Bearing flushing is required for a safe, continuous operation under the following operating conditions:

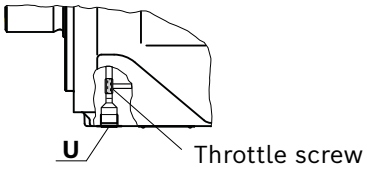
- When installed vertically (drive shaft up) for lubricating the front bearing and shaft seal
- When operated at temperature and viscosity limits when using mineral oil
- When installed above the reservoir

Port "**U**" at the front flange of the variable displacement pump is used for bearing flushing. The flushing fluid flows through the front bearing and discharges with the pump drain at the drain port.
The following flushing flows are recommended depending on size:

NG		40	71	125	180
q_{Sp}	l/min	3	4	5	7

For the flushing flows indicated, there is a pressure differential of approx. 2 (Series 11) or 3 (Series 30) bar between port "**U**" (including fitting) and the housing area.

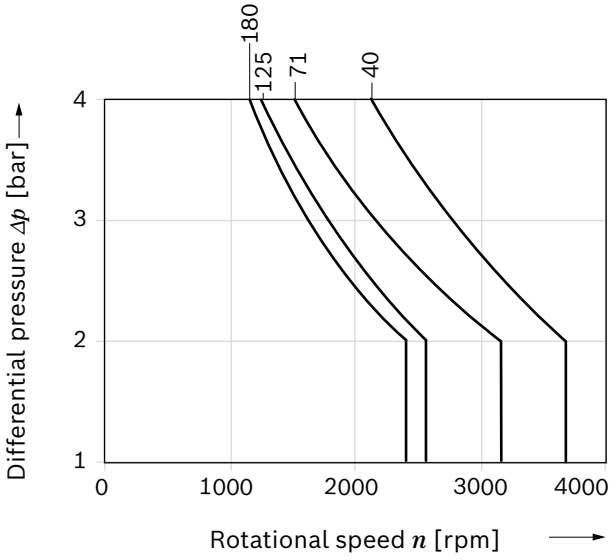
Notice about bearing flushing for series 30
When using bearing flushing on port **U**, the throttle screw in port **U** must be turned in to the end stop.



Shaft seal

Permissible pressure load

The service life of the shaft seal ring is affected by the rotational speed of the pump and the leakage pressure. It is recommended that the average, continuous leakage pressure of 2 bar absolute at operating temperature not be exceeded (maximum permissible leakage pressure of 4 bar absolute at reduced rotational speed; see diagram). Momentary (t < 0.1 s) pressure peaks of up to 6 bar absolute are acceptable. The service life of the shaft seal ring decreases with an increase in the frequency of pressure peaks.
The case pressure must be equal to or greater than the external pressure on the shaft seal.



Case pressure at ports K2, K3, R(L)		
Maximum pressure static $p_{L\,max}$	3 bar[1)]	
Maximum pressure dynamic $p_{L\,max}$	5 bar[2)]	
Pressure peaks $p_{L\,peak}$	6 bar	t < 0.1 s

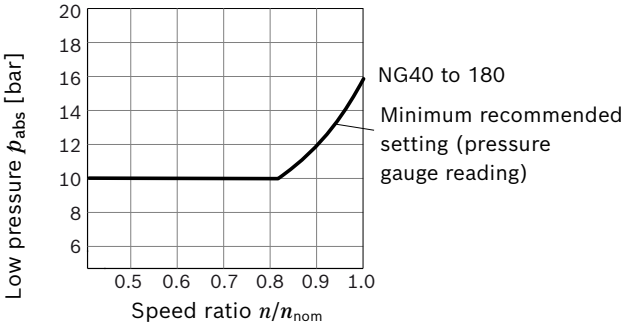
Notice
At case pressure 0 to 3 bar without special version.
At case pressure 1 to 5 bar with special version S1111

1) Permissible differential pressure on shaft seal (case pressure to ambient pressure), not to exceed $p_{L\,max.}$ A drain line to the reservoir is required.
2) Only with double shaft seal, see type code position 15

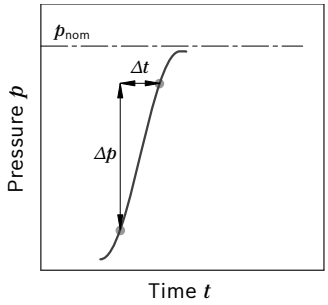
Working pressure range

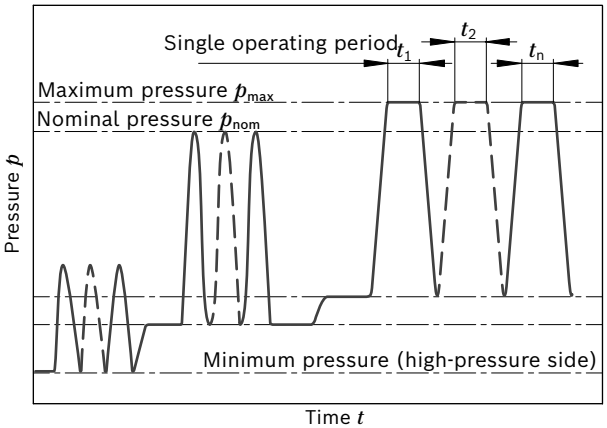
Pressure at working port A or B			**Definition**
Nominal pressure p_{nom}		350 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}		400 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Single operating period		1 s	
Total operating period		300 h	
Minimum pressure (high-pressure side)		15 bar	Minimum pressure on the high-pressure side (**A** or **B**) required to prevent damage to the axial piston unit.
Minimum pressure (low-pressure side)		Speed-related (see diagram)	Minimum pressure on the low-pressure side (**A** or **B**) required to prevent damage to the axial piston unit. The low pressure is applied at port **M_{K4}** when the flushing slide is deflected.
Rate of pressure change $R_{A\,max}$		16000 bar/s	Maximum permissible pressure build-up and reduction speed during a pressure change across the entire pressure range.
Recommended boost pressure p_{SP} (inlet)			
Minimum boost pressure p_{Sp} (at n_{nom})		16 bar	NG40 to 180
Maximum static boost pressure $p_{Sp\,max}$		25 bar	Measuring port: **M_{K4}** (Please contact us for multiple coupled pumps.)
Permissible pressure peaks in boost pressure	minimum	4 bar abs.	
	maximum	40 bar	
Control pressure for EP and HD control			
Minimum required control pressure $p_{St\,min}$		Double boost pressure	Measuring port **M_1** (small stroking chamber)
Case pressure at ports K2, K3, R(L)			
Maximum static pressure $p_{L\,max}$		0 to 3 bar Without special version	Permissible differential pressure on shaft seal (case pressure to ambient pressure), not to exceed $p_{L\,max.}$ A drain line to the reservoir is required.
Maximum dynamic pressure $p_{L\,max}$		1 to 5 bar only in special version	Only with double shaft seal, see type code position 15
Pressure peaks $p_{L\,peak}$		6 bar abs.	t < 0.1 s

▼ **Required low pressure depending on speed ratio**



▼ **Rate of pressure change**





Total operating period = $t_1 + t_2 + ... + t_n$

Notice

Working pressure range applies when using hydraulic fluids based on mineral oils.

All assembled parts must meet the ATEX classification for the application in question.

Technical data

Size		NG		40	71	125	180
Displacement geometric, per revolution		$V_{g\,max}$	cm³	40	71	125	180
Rotational speed maximum[1)]	at $V_{g\,max}$	n_{max}	rpm	2400	2400	2400	2400
Flow	at n_{max} and $V_{g\,max}$	q_v	l/min	96	170	300	432
	at 1500 rpm and $V_{g\,max}$			60	107	186	270
Power	at n_{max}, $V_{g\,max}$ and Δp = 350 bar	P	kW	56	99	175	252
	at 1500 rpm, $V_{g\,max}$ and Δp = 350 bar			35	62	109	158
Torque	at $V_{g\,max}$ and Δp = 350 bar	T	Nm	223	395	696	1002
	at $V_{g\,max}$ and Δp = 100 bar			64	113	199	286
Rotary stiffness Drive shaft	P	c	kNm/rad	80	146	260	328
	Z	c	kNm/rad	77	146	263	332
Moment of inertia of the rotary group		J_{TW}	kgm²	0.0049	0.0121	0.03	0.055
Maximum angular acceleration[2)]		α	rad/s²	17000	11000	8000	6800
Case volume		V	l	2	2.5	5	4
Weight approx.		m	kg	42	60	107	112

Determining the operating characteristics				
Flow	$q_v = \frac{V_g \times n \times \eta_v}{1000}$			[l/min]
Torque	$T = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$			[Nm]
Power	$P = \frac{2\pi \times T \times n}{60000}$	=	$\frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

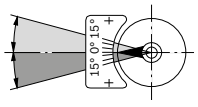
Key

V_g	Displacement per revolution [cm³]
Δp	Differential pressure [bar]
n	Rotational speed [rpm]
η_v	Volumetric efficiency
η_{hm}	Hydraulic-mechanical efficiency
η_t	Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notices

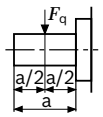
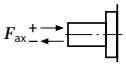
- Theoretical values, without efficiency and tolerances; values rounded
- Exceeding the maximum/dropping below the minimum values can lead to a loss of function, reduction in service life or destruction of the axial piston unit, thereby nullifying explosion protection. We recommend checking loads through tests or calculation/simulation and comparing them with the permissible values.

Flow direction

Direction of rotation		Swiveling range	
clockwise	counter-clockwise		
B to **A**	**A** to **B**	clock-wise	
A to **B**	**B** to **A**	counter-clock-wise	

1) The values are applicable:
   – for the optimum viscosity range from ν_{opt} = 36 to 16 mm²/s
   – with hydraulic fluid on the basis of mineral oils
2) The data are valid for values between the minimum required and maximum permissible rotational speed.
   Valid for external excitation (e. g. diesel engine 2 to 8 times rotary frequency; cardan shaft twice the rotary frequency).
   The limit value is only valid for a single pump.
   The load capacity of the connection parts must be considered.

Permissible radial and axial loading on the drive shafts

Size		NG		40	71	125	180
Maximum radial force at distance a/2		$F_{q\,max}$	N	1000	1200	1600	2000
Maximum axial force		+ $F_{ax\,max}$	N	600	800	1000	1400
		– $F_{ax\,max}$	N				

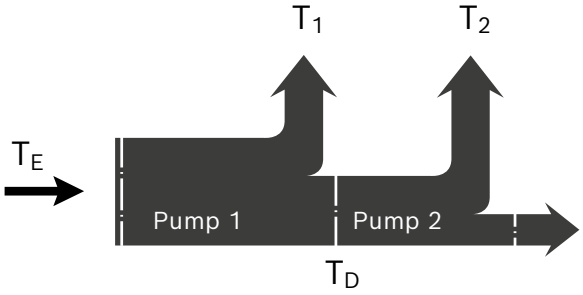
Notices

- Do not use a belt drive.
- Force-transfer direction of the permissible axial force
  + $F_{ax\,max}$= Increase in service life
  – $F_{ax\,max}$= Reduction in bearing service life

Permissible input and through-drive torques

Size			NG		40	71	125	180
Torque at $V_{g\,max}$ and Δp = 350 bar[1]			T_{max}	Nm	223	395	696	1002
Maximum input torque on drive shaft[2)]								
	Splined shaft	Z	$T_{E\,max}$	Nm	446	790	1392	2004
	Shaft key	P	$T_{E\,max}$	Nm	380	700	1392	1400
Maximum through-drive torque			$T_{D\,max}$	Nm	$T_{D\,max} = T_{E\,max}$			

▼ **Distribution of torques**



Torque at 1st pump	T_1		
Torque at 2nd pump	T_2		
Torque at 3rd pump	T_3		
Input torque	T_E	=	$T_1 + T_2 + T_3$
	T_E	<	$T_{E\,max}$
Through-drive torque	T_D	=	$T_2 + T_3$
	T_D	<	$T_{D\,max}$

1) Efficiency not considered
2) For drive shafts free of radial force

EP – Electrohydraulic control with proportional solenoids

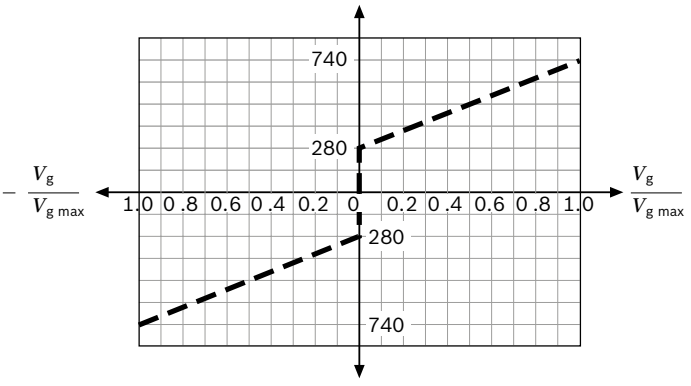
Function

Depending on the preselected current strength, the stroking cylinder of the pump is charged with control pressure via two proportional solenoids on the EP control module. This allows the swashplate – and, thereby, the displacement – to be continuously adjusted.

The mechanical swivel angle limit can be set on both sides between $V_{g\,max}$ and 50% $V_{g\,max}$.

A proportional solenoid is assigned to each flow direction. The proportional solenoids should not be operated with a current higher than the rated current. In addition, each proportional solenoid should be protected by a fuse matching its rated current (maximum 3 I_{nom} as per IEC/EN 60127-2) or a motor protection switch with a short-circuit and thermal fast-triggering mechanism (set to rated current). The breaking capacity of this fuse should be equal to or greater than the possible short circuit current of the supply voltage source.

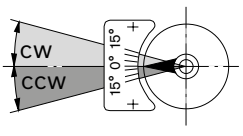
▼ **Characteristic curve**



Correlations of direction of rotation–solenoid–flow direction

Direction of rotation	Solenoid	Swivel direction[1)]	Flow direction	Pressure side
clockwise	b	clockwise	**B** to **A**	**A**
	a	counter-clockwise	**A** to **B**	**B**
counter-clockwise	b	clockwise	**A** to **B**	**B**
	a	counter-clockwise	**B** to **A**	**A**

1) Cf. swivel angle indicator



Ground connection

All solenoids and pumps should have a ground connection. For ground connection points, refer to the relevant installation drawing in the chapter "Dimensions".

Pressure control

Pressure relief separated by pressure sides via the ports $\mathbf{X_{A2}}$ and $\mathbf{X_{B2}}$ comes standard.

The differential pressure for each pressure controller is set to 30 bar and needs approx. 2 l/min control pressure fluid.

Notices on setting remote-controlled pressure control

The setting for the integrated pressure relief valve plus the differential pressure in the pressure valve determines the level of pressure control.

Example:

Internal pressure relief valve	290 bar
Differential pressure in pressure controller	30 bar
resulting pressure control of	320 bar

Notice

The spring feedback in the controller is not a safety device.

The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.

Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

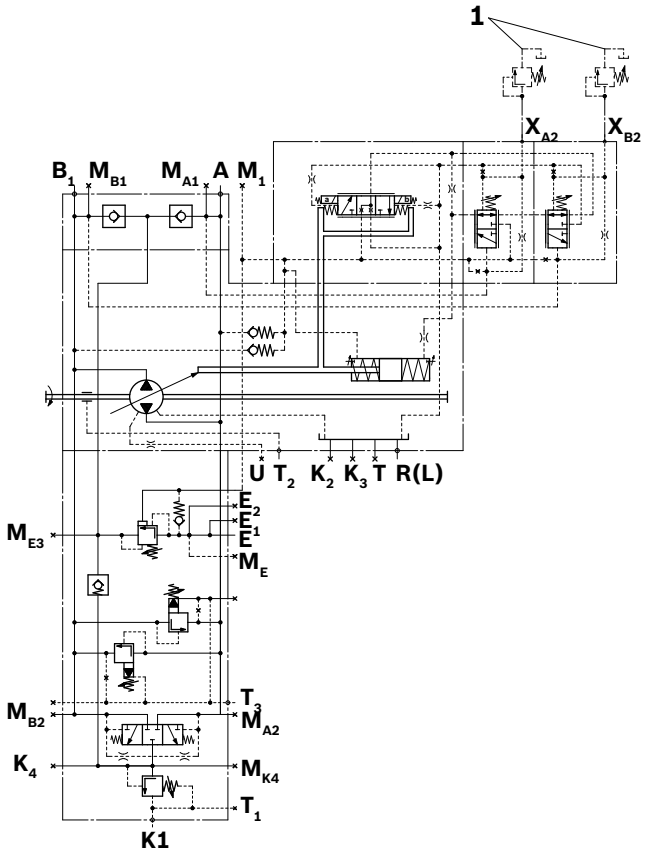
Solenoid technical data

Axial piston units come with the following solenoids.

Size			40/71	125/180
Proportional solenoid type			GRCE 037 AGD L02	GRCE 063 AGD G01
Version			002	001
Designation			R913035725 – 24VDC	R913030728 – 24 VDC
Tube			FHTP037926169 or MSM926169-P	FHTP 062 924251 or MSM 924251-P
Mounting nut			MSM 902176	MSM 472794
O-ring			19 × 2.5 – 70Sh A NBR	31 × 2.5 – 70Sh A NBR
Solenoid body – variant			FHMPE 037 926799 – 002	FHMPE 063 926635 – 001
Resistance	R_{20}	Ω	23.1	20.2
Rated current	I_{nom}	A DC	0.6	0.800
Maximum current control range	$I_G = 1.1 \times I_{nom}$	A	0 to 0.660	0 to 0.880
Rated voltage	U_R	V	24.2	24.2
Limit power	P_L	W	15.6	24.9
Waviness	W	%	48	48
Duty cycle	ED		S1	S1 (100 %)
Ambient temperature	T_A	°C	-30 to +65	-30 to +65
Temperature class			T4	T4
Supply			Current source must be suitable for a protection class III appliance (extra-low protective voltage).	Current source must be suitable for a protection class III appliance (extra-low protective voltage).
Connection line			FL4G11Y 3 × 1.5 mm^2	FL4G11Y 2 × 1.5 mm^2
Diode for limiting disconnect overvoltage			Internally molded 1.5 KE68CA maximum 90 V	Internally molded 1.5 KE68CA maximum 90 V
Disconnect overvoltage			Maximum 90 V	Maximum 90 V
Maximum switching frequency			5 switches/s	4 switches/s
Explosion protection per Directive 2014/34/EC and IECEx			CE 0637 Ex II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T130 °C Db	CE 0637 Ex II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T130 °C Db
In compliance with standards			EN 60079-0: 2012 EN 60079-18: 2009 IEC 60079-0: 2011 IEC 60079-18: 2009	EN 60079-0: 2012 EN 60079-18: 2009 IEC 60079-0: 2011 IEC 60079-18: 2009
EC type examination certificate			IBExU 13 ATEX 1040 X	IBExU 13 ATEX 1040 X
IECEx certificate of conformity			IECEx IBE 13.0017 X	IECEx IBE 13.0017 X
Type of protection according to IEC/EN 60529			Minimum IP67	Minimum IP67
Protection class according to DIN VDE 0580			I	III
EC declaration of conformity			DC013360-002	DC013315-001

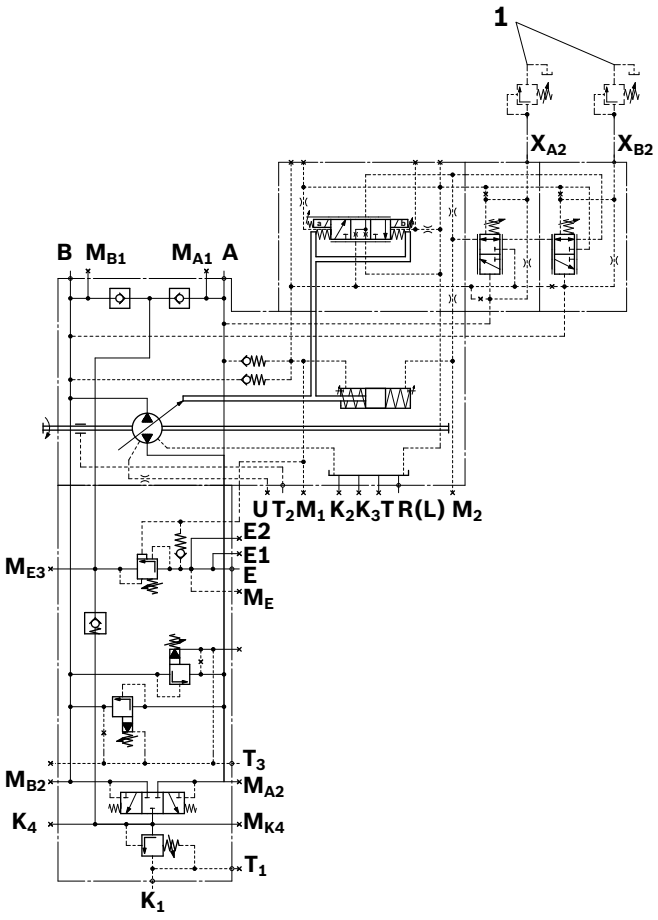
Circuit diagram

▼ **Circuit diagram A4VSG 40 to 71 EP.G**
ATEX category II 2G Ex h IIC T4-T1 Gb X and
ATEX category II 3G Ex h IIC T4-T1 Gc X



Ports for	
A, B	Working line (pressure port)
R(L)	Filling and air bleeding
K_1, K_2, K_3	(drain port)
K_4	Accumulator port
T	Fluid drain
T_1	Air bleed port Pressure relief valve
T_2	Shaft seal air bleed port
T_3	Air bleed port Pressure relief valve
E	Boost pressure supply (external)
E_1	Filter, supply
E_2	Filter, return
X_{A2}, X_{B2}	Remote control pilot pressure port
M_{E3}, M_{K4}	Measuring boost pressure
M_E	Measuring boost pressure supply
M_{A1}, M_{B1}	Working pressure measurement
M_{A2}, M_{B2}	Working pressure measurement
U	Bearing flushing

▼ **Circuit diagram A4VSG 125 to 180 EP.G**
ATEX category II 2G Ex h IIC T4-T1 Gb X and
ATEX category II 3G Ex h IIC T4-T1 Gc X



1 Not included in scope of delivery

Notice
All assembled parts must meet the ATEX classification for the application in question.

HD1/2/3 – Hydraulic control, pilot-pressure related

Function

The HD1/2/3 control sets the displacement of the pump based on the pilot pressure.

A stroking chamber is continuously supplied with control pressure. The control spool is deflected by the differential pilot pressure $\mathbf{X_1}$–$\mathbf{X_2}$ and controls the fluid supply of the other stroking chamber.

A spring feedback returns the control stroke to the control spool. The control stroke can thus be controlled proportionally to the setpoint value ($\mathbf{X_1}$–$\mathbf{X_2}$).

manual.

When rating the pilot pressure, make sure the effective hydraulic control pressure setpoint value for the A4VSG is the difference between $\mathbf{X_1}$ and $\mathbf{X_2}$.

- Upon loss of pilot pressure, the spring feedback will return the control to the neutral position.
- Upon loss of control pressure, the spring centering of the stroking piston assists in the return to the neutral position.

Both features are standard.

The mechanical swivel angle limit can be set on the control between $V_{g\,max}$ and 50% $V_{g\,max}$

.

Three versions are available:

HD1 pilot pressure range 10...45 bar

HD2 pilot pressure range 10...28 bar

HD3 pilot pressure range 5.5...19 bar

A version with an inductive position transducer is available on request.

- The HD.T and HD.U control variants are not available in ATEX.

Control pressure and pilot pressure supply

For the A4VSG, the minimum required control pressure must be externally connected to **P** and facilitates zero stroke control when the pump itself has not yet built up pressure. The high pressure in the pump supplies control pressure when $\mathbf{p_A}$, $\mathbf{p_B}$ > $\mathbf{p}$.

Recommendation: separate control/pilot pressure pump for sizes 40...180, an auxiliary pump with 8 cm^3. Direct mounting on A4VSG through drive possible.

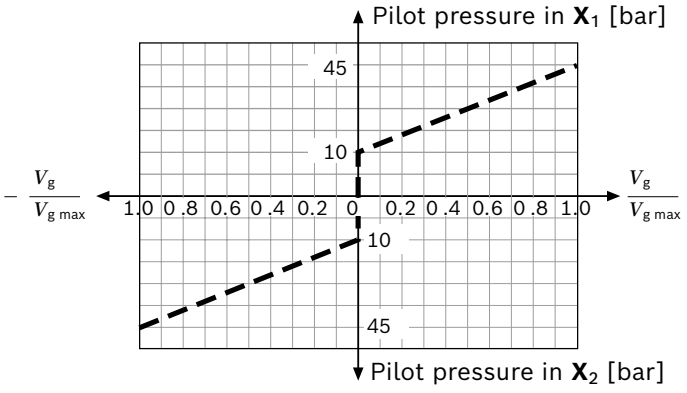
Notice

The spring feedback in the controller is not a safety device.

The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.

Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

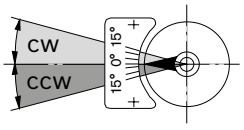
▼ **HD1/HD2 characteristic curve**



Correlations of direction of rotation–pilot pressure–flow direction

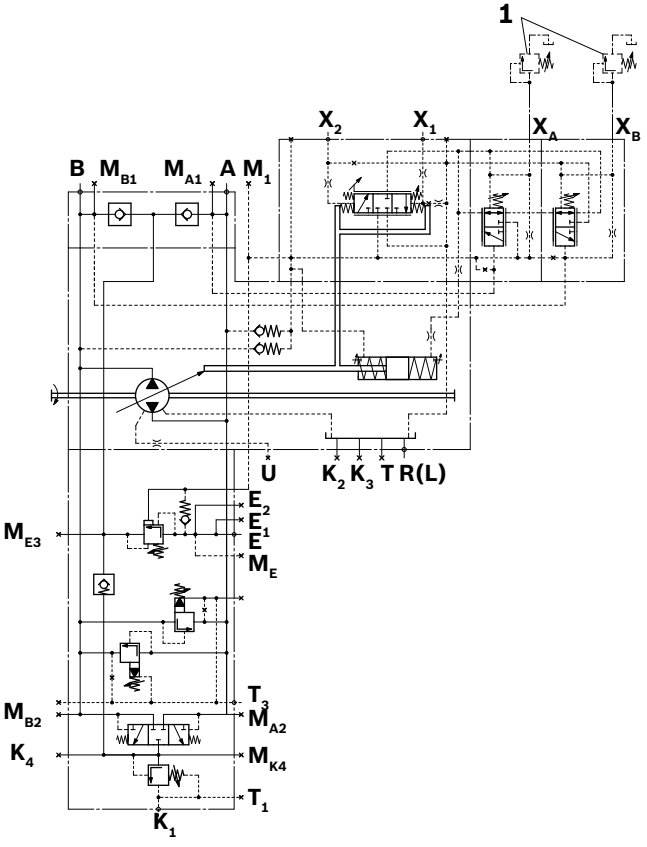
Direction of rotation	Pilot pressure	Swivel direction[1)]	Flow direction	Pressure side
clockwise	in $\mathbf{X_1}$	clockwise	**B** to **A**	**A**
	in $\mathbf{X_2}$	counter-clockwise	**A** to **B**	**B**
counter-clockwise	in $\mathbf{X_1}$	clockwise	**A** to **B**	**B**
	in $\mathbf{X_2}$	counter-clockwise	**B** to **A**	**A**

1) Cf. swivel angle indicator

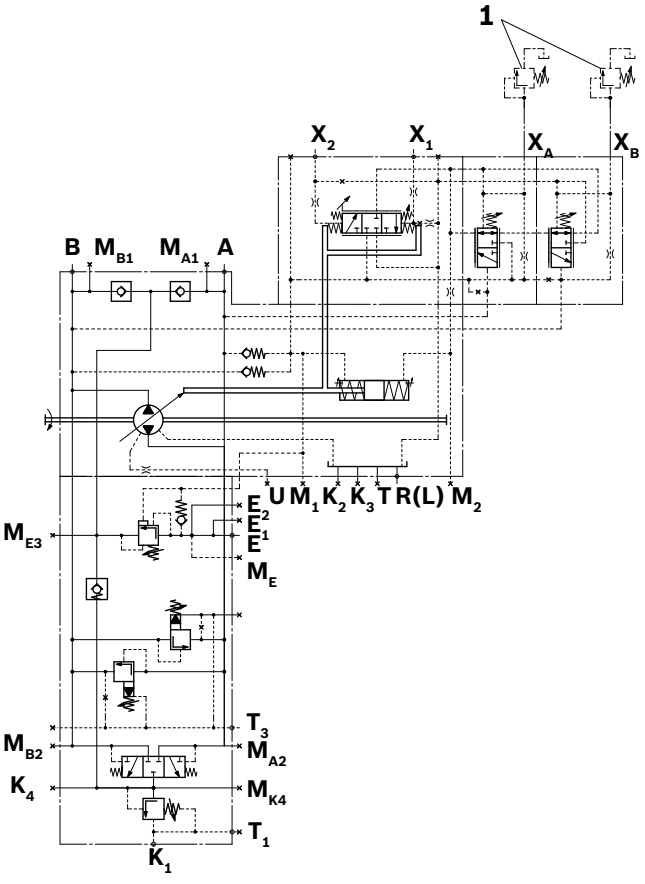


Circuit diagram

▼ **Circuit diagram A4VSG 40 to 71 HD.G**
ATEX category II 2G Ex h IIC T4-T1 Gb X and
ATEX category II 3G Ex h IIC T4-T1 Gc X



▼ **Circuit diagram A4VSG 125 to 180 HD.G**
ATEX category II 2G Ex h IIC T4-T1 Gb X and
ATEX category II 3G Ex h IIC T4-T1 Gc X



Ports for		State[1)]
A, B	Working line (pressure port)	O
R(L)	Filling and air bleeding	O
K_1, K_2, K_3	(drain port)	X
K_4	Accumulator port	X
T	Fluid drain	X
T_1	Air bleed port Pressure relief valve	O
T_3	Air bleed port Pressure relief valve	X
E	Boost pressure supply (external)	O
E_1	Filter, supply	X
E_2	Filter, return	X
X_A, X_B	Remote control pilot pressure port	O
X_1, X_2	Pilot pressure port for pressure controller	O
M_{E3}, M_{K4}	Measuring boost pressure	X
M_E	Measuring boost pressure supply	X
M_{A1}, M_{B1}	Working pressure measurement	X
M_{A2}, M_{B2}	Working pressure measurement	X
U	Bearing flushing	X

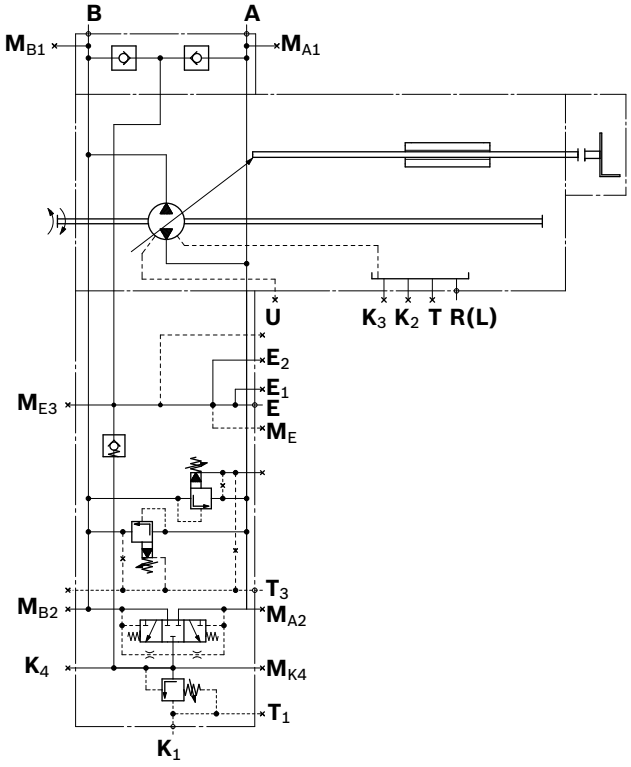
1 Not included in scope of delivery

Notice
All assembled parts must meet the ATEX classification for the application in question.

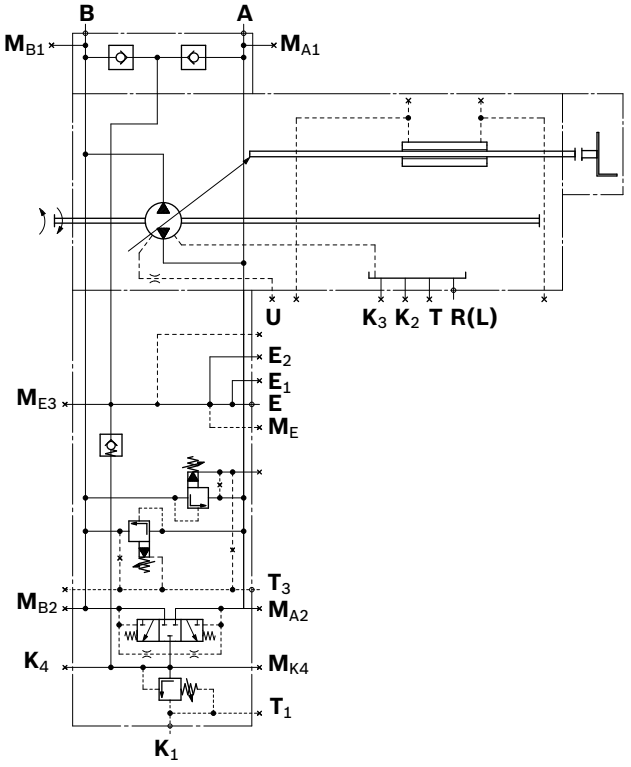
MA – Manual control

Manual control enables adjustment of the pump displacement by rotating the handwheel.
The change of displacement can be monitored via the swivel angle indicator.
The MA adjustment has a locking lever for fixing the displacement during operation.

▼ **Circuit diagram A4VSG 40 to 71 MA**
ATEX category II 2G Ex h IIC T4-T1 Gb X and
ATEX category II 3G Ex h IIC T4-T1 Gc X



▼ **Circuit diagram A4VSG 125 to 180 MA**
ATEX category II 2G Ex h IIC T4-T1 Gb X and
ATEX category II 3G Ex h IIC T4-T1 Gc X

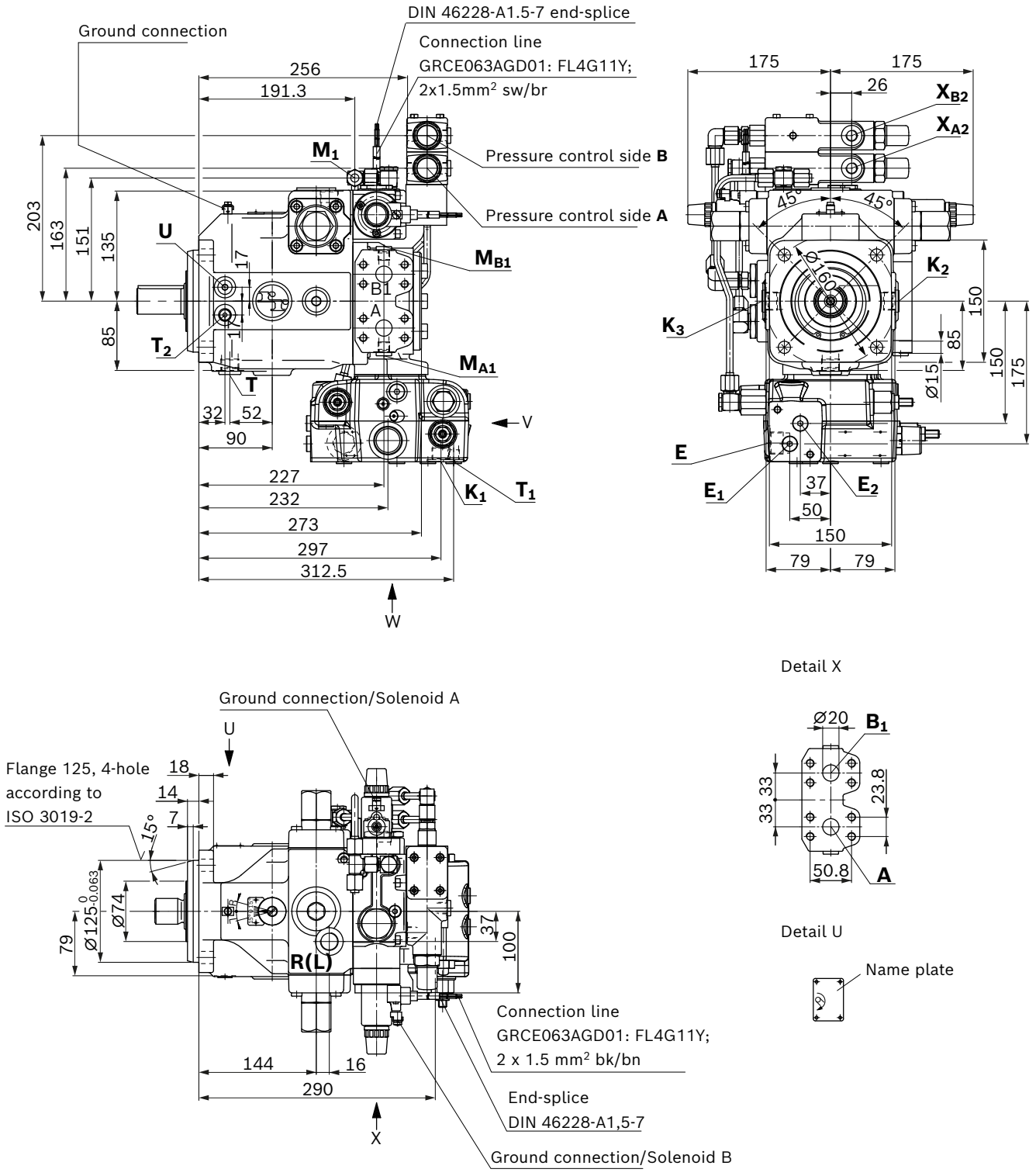


Ports for		State[1)]
A, B	Working line (pressure port)	O
R(L)	Filling and air bleeding	O
K_1, K_2, K_3	(drain port)	X
T	Fluid drain	X
T_1	Air bleed port Pressure relief valve	O
T_3	Air bleed port Pressure relief valve	X
E	Boost pressure supply (external)	O
E_1	Filter, supply	X
E_2	Filter, return	X
M_{E3}, M_{K4}	Measuring boost pressure	X
M_E	Measuring boost pressure supply	X
M_{A1}, M_{B1}	Working pressure measurement	X
M_{A2}, M_{B2}	Working pressure measurement	X
U	Bearing flushing	X

Notice
All assembled parts must meet the ATEX classification for the application in question.

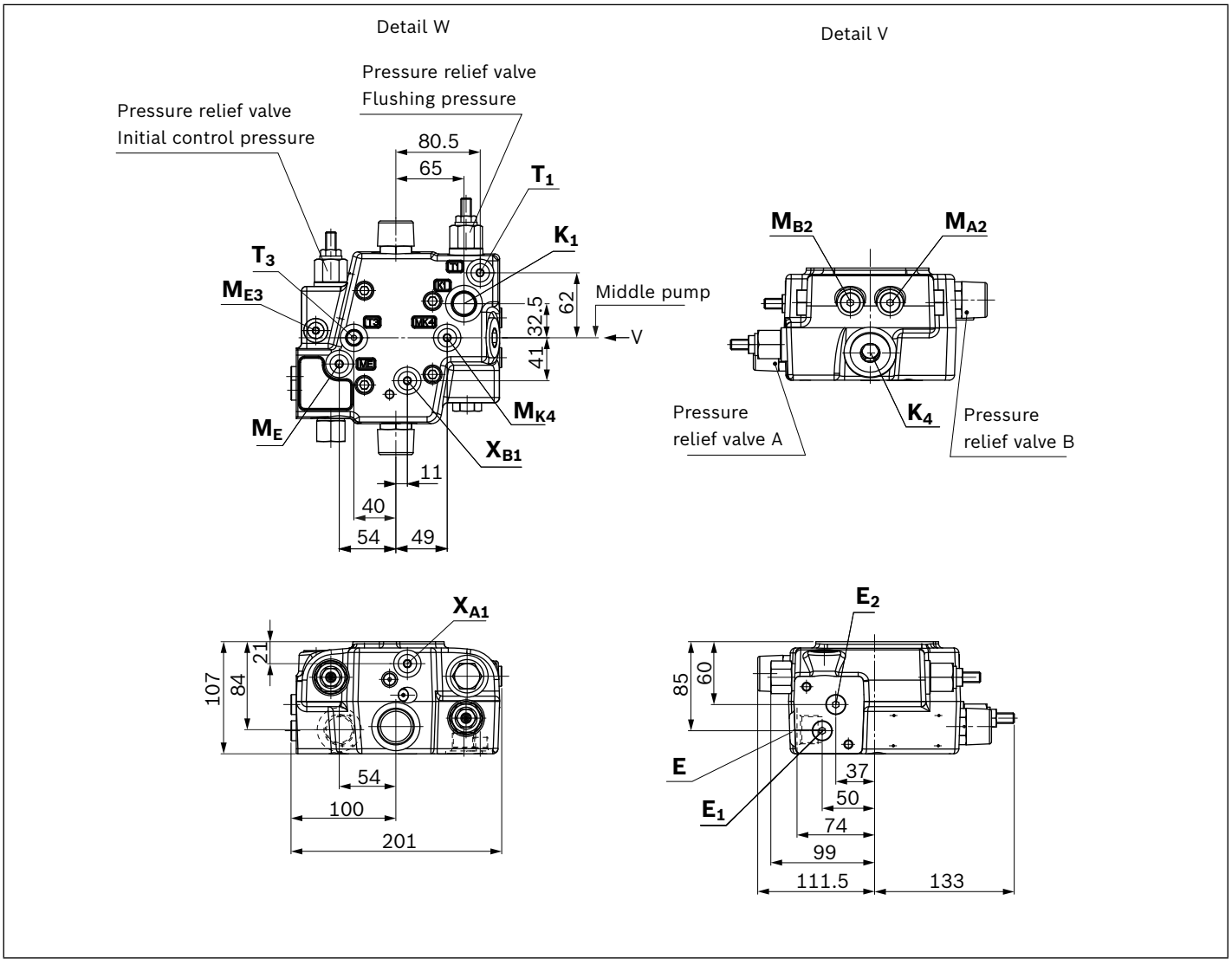
Dimensions of NG40 ATEX category II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X

EP.G – Remote-controlled electrohydraulic control with proportional solenoid and pressure control



For connection table, see page 18

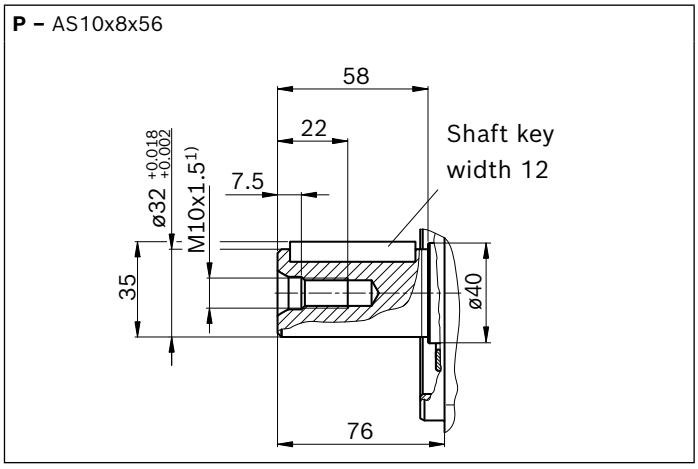
Valve block SDVB 16 (order item 13)



Hydraulic fluid; outlet in B_1 when:		
Drive direction	clockwise	Solenoid A
Swivel direction	counter-clockwise	
Hydraulic fluid; outlet in A when:		
Drive direction	clockwise	Solenoid B
Swivel direction	clockwise	

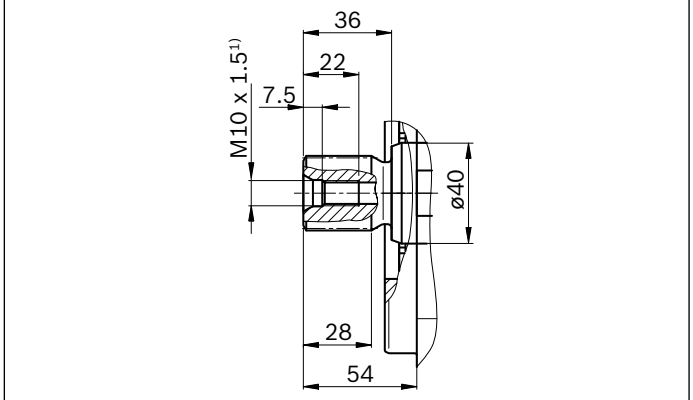
▼ **Parallel keyed shaft DIN 6885**

P – AS10x8x56



▼ **Splined shaft DIN 5480**

Z – W32x2x14x9g

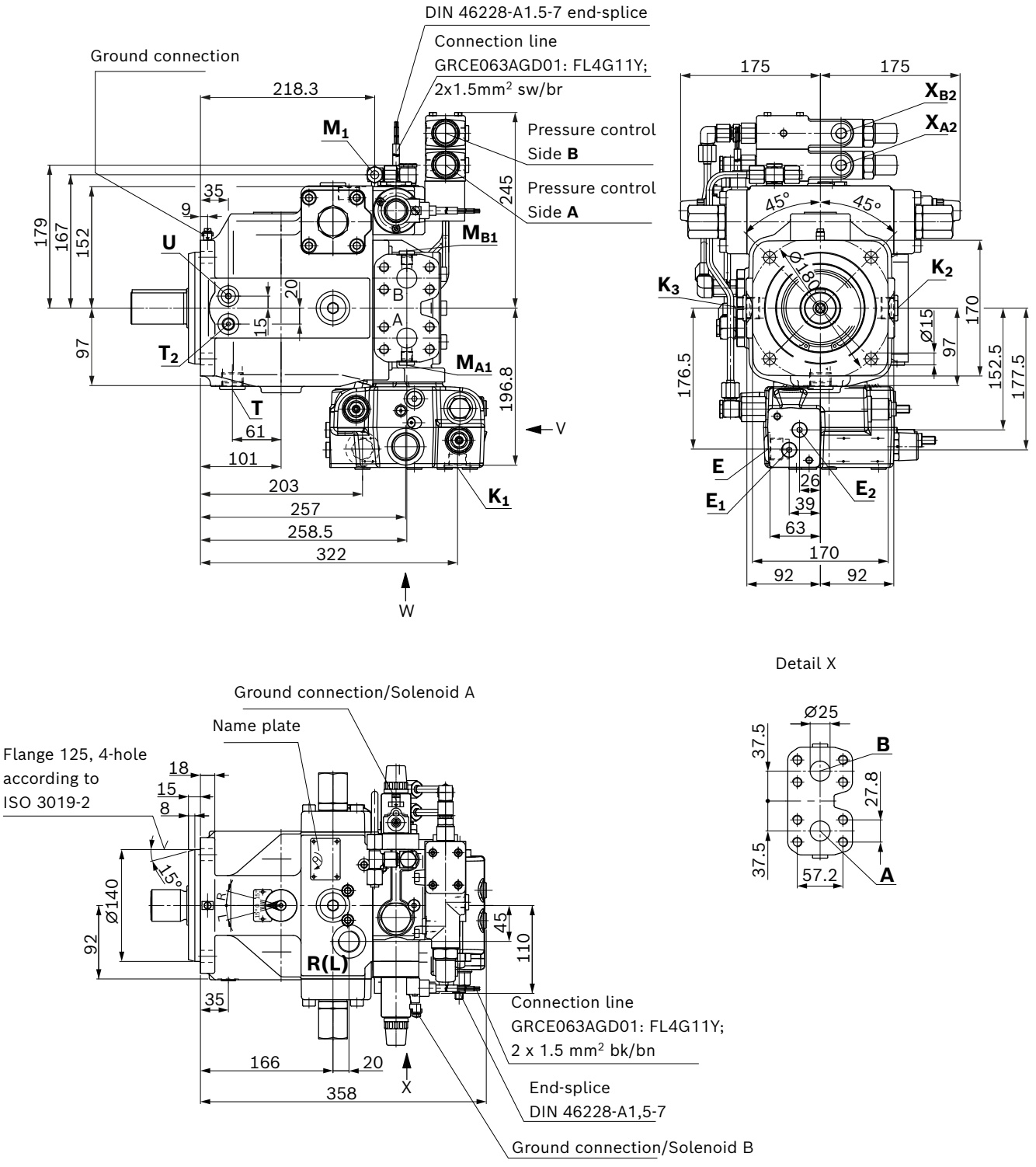


Ports		Standard	Size	$p_{max\ abs}$ [bar] 2)	State 6)
A, B_1	Working port (high-pressure series) Fastening thread **A**/**B**	SAE J518 DIN 13	3/4 in M10 × 1.5; 17 deep	400	O
M_E	Boost pressure supply measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
E	Boost pressure supply (external)	DIN 13	M27 × 2; 16 deep	40	O
E_1	Filter, supply	DIN 13	M14 × 1.5; 12 deep	40	X
E_2	Filter, return	DIN 13	M14 × 1.5; 12 deep	40	X
M_{E3}	Boost pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
K_1	Flushing port	DIN 3852 4)	M22 × 1.5; 14 deep	4	O
K_2, K_3	Flushing port	DIN 3852 4)	M22 × 1.5; 14 deep	4	X
K_4	Accumulator port	DIN 3852 4)	M33 × 2; 18 deep	40	X
M_{K4}	Flushing pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
M_{A1}, M_{B1}	Pressure measuring port **A_1**, **B_1**	DIN 13	M14 × 1.5; 12 deep	400	X
M_{A2}, M_{B2}	Pressure measuring port **A_2**, **B_2**	DIN 13	M14 × 1.5; 12 deep	400	X
M_1	Control pressure measuring port	DIN 3853 4)	S8 form W	400	X
R(L)	Fluid filling, air bleeding	DIN 3852 4)	M22 × 1.5; 14 deep	4	O 3), 5)
T	Fluid drain	DIN 3852 4)	M22 × 1.5; 12 deep	4	X 5)
T_1	Pressure relief valve relief port	DIN 3852 4)	M14 × 1.5; 12 deep	4	X
T_2	Shaft seal relief port	DIN 3852 4)	M14 × 1.5; 12 deep	4	O 7)
T_3	Pressure relief valve relief port	DIN 3852 4)	M14 × 1.5; 12 deep	4	O
U	Flushing port (bearing flushing)	DIN 3852 4)	M14 × 1.5; 12 deep	7	X
X_{A2}, X_{B2}	Pilot pressure port for pressure controller	DIN 3852 4)	M14 × 1.5; 12 deep	400	O

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Only open port **R** for filling and air bleeding.
4) The countersink may be deeper than specified in the standard.
5) Depending on installation position, **T** or **R**(**L**) needs to be connected.
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Port **T_2** must be connected to the reservoir to relieve pressure on the double shaft seal.

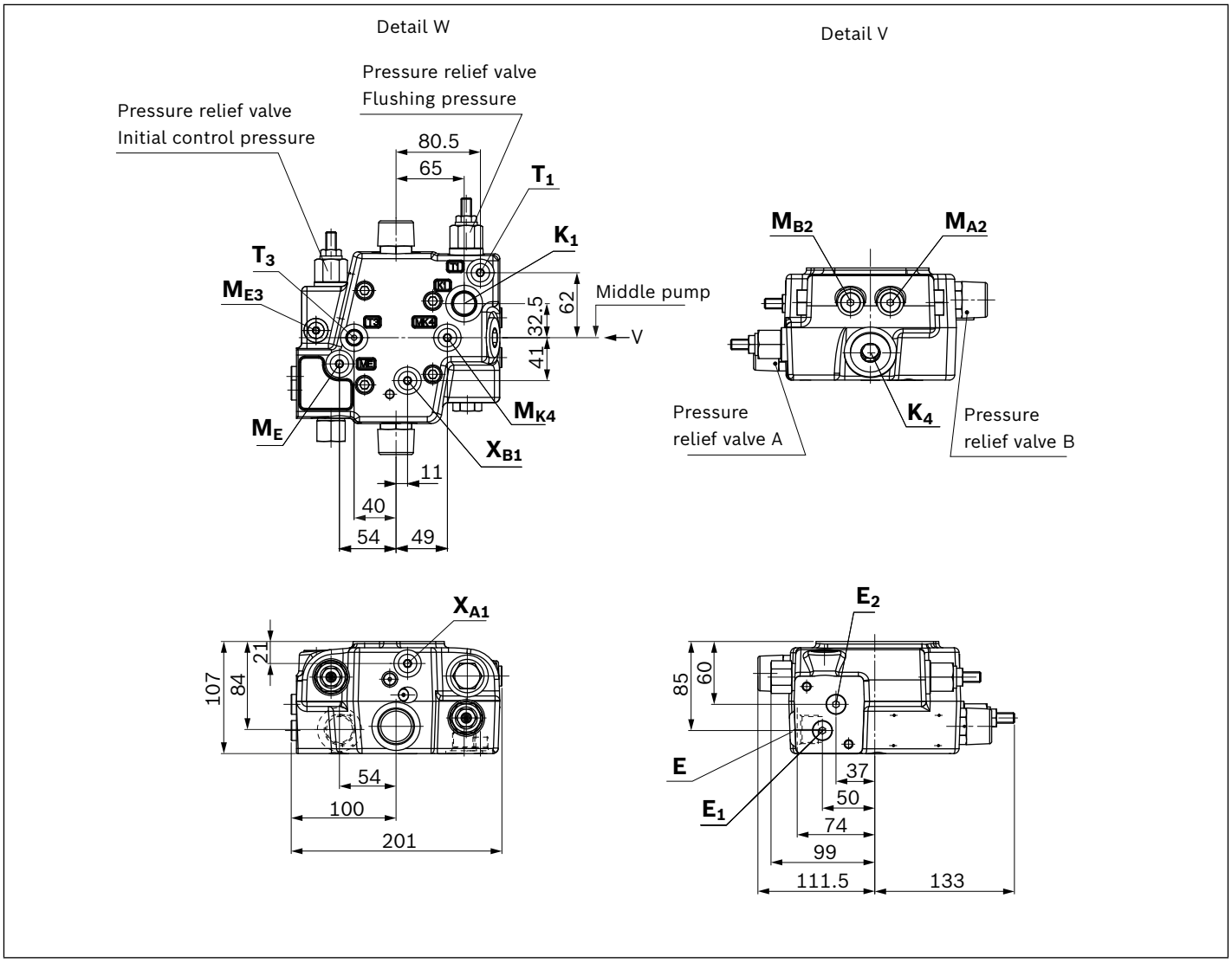
Dimensions of NG71 ATEX category II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X

EP.G – Remote-controlled electrohydraulic control with proportional solenoid and pressure control and no attachment pump



For connection table, see page 21

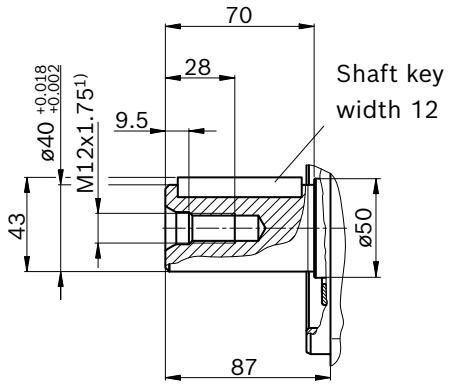
Valve block SDVB 16 (order item 13)



Hydraulic fluid; outlet in B_1 when:		
Drive direction	clockwise	Solenoid A
Swivel direction	counter-clockwise	
Hydraulic fluid; outlet in A when:		
Drive direction	clockwise	Solenoid B
Swivel direction	clockwise	

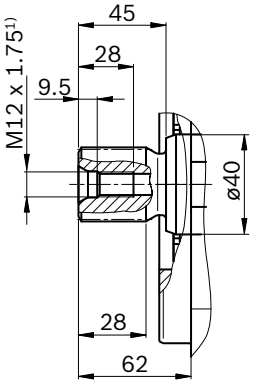
▼ **Parallel keyed shaft DIN 6885**

P – AS12x8x68



▼ **Splined shaft DIN 5480**

Z – W40x2x18x9g

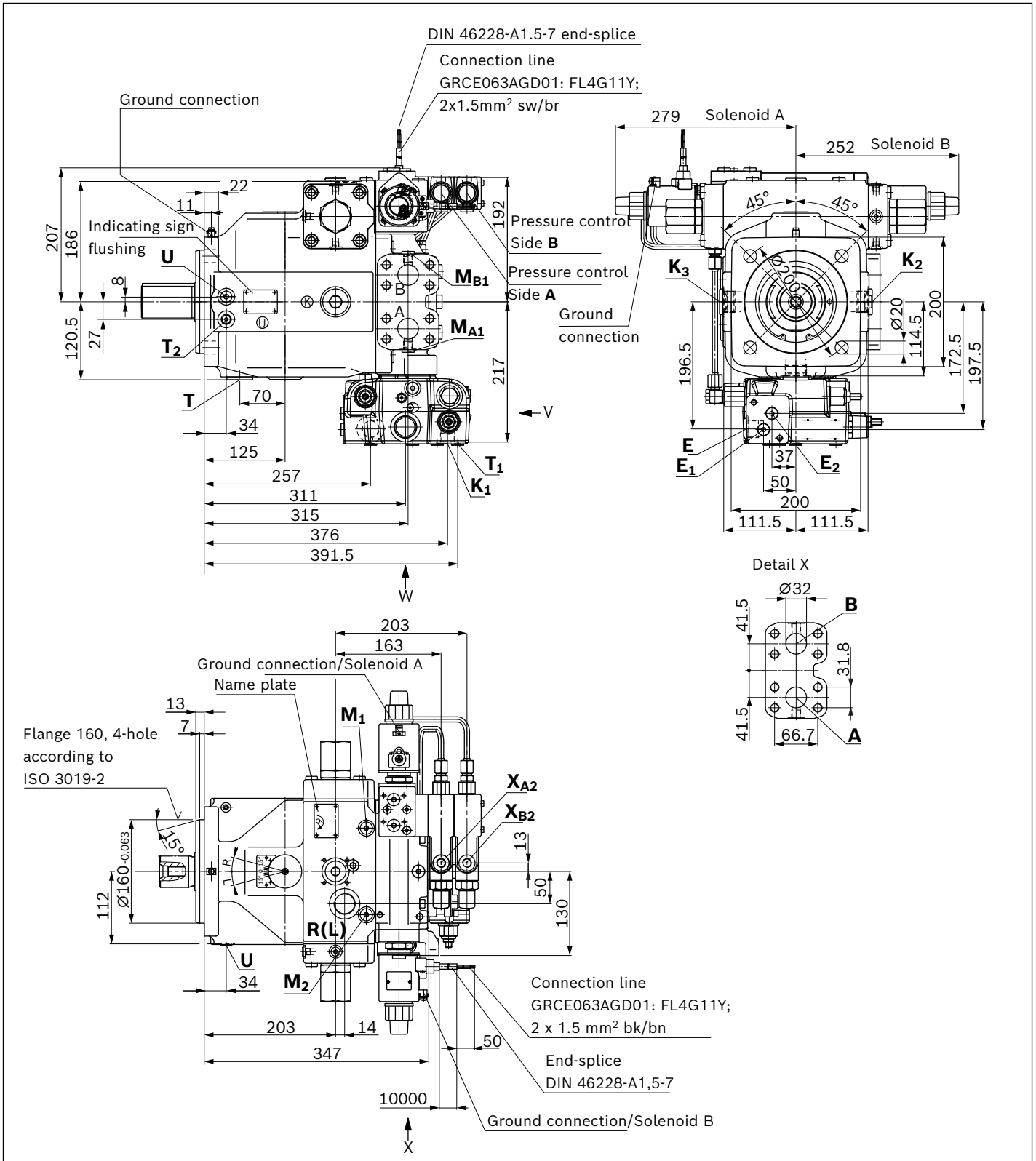


Ports		Standard	Size	$p_{max\ abs}$ [bar][2]	State[6]
A, B_1	Working port (high-pressure series) Fastening thread **A**/**B**	SAE J518 DIN 13	1 in M12 × 1.75; 17 deep	400	O
M_E	Boost pressure supply measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
E	Boost pressure supply (external)	DIN 13	M27 × 2; 16 deep	40	O
E_1	Filter, supply	DIN 13	M14 × 1.5; 12 deep	40	X
E_2	Filter, return	DIN 13	M14 × 1.5; 12 deep	40	X
M_{E3}	Boost pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
K_1	Flushing port	DIN 3852[4]	M22 × 1.5; 14 deep	4	O
K_2, K_3	Flushing port	DIN 3852[4]	M27 × 2; 14 deep	4	X
K_4	Accumulator port	DIN 3852[4]	M33 × 2; 18 deep	40	X
M_{K4}	Flushing pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
M_{A1}, M_{B1}	Pressure measuring port **A_1**, **B_1**	DIN 13	M14 × 1.5; 12 deep	400	X
M_{A2}, M_{B2}	Pressure measuring port **A_2**, **B_2**	DIN 13	M14 × 1.5; 12 deep	400	X
M_1	Control pressure measuring port	DIN 3853[4]	S8 form W	400	X
R(L)	Fluid filling, air bleeding	DIN 3852[4]	M27 × 2; 14 deep	4	O[3), 5)]
T	Fluid drain	DIN 3852[4]	M27 × 2; 12 deep	4	X[5)]
T_1	Pressure relief valve relief port	DIN 3852[4]	M14 × 1.5; 12 deep	4	X
T_2	Shaft seal relief port	DIN 3852[4]	M14 × 1.5; 12 deep	4	O[7)]
T_3	Pressure relief valve relief port	DIN 3852[4]	M14 × 1.5; 12 deep	4	O
U	Flushing port (bearing flushing)	DIN 3852[4]	M14 × 1.5; 12 deep	7	X
X_{A2}, X_{B2}	Pilot pressure port for pressure controller	DIN 3852[4]	M14 × 1.5; 12 deep	400	O

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Only open port **R** for filling and air bleeding.
4) The countersink may be deeper than specified in the standard.
5) Depending on installation position, **T** or **R**(**L**) needs to be connected.
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Port **T_2** must be connected to the reservoir to relieve pressure on the double shaft seal.

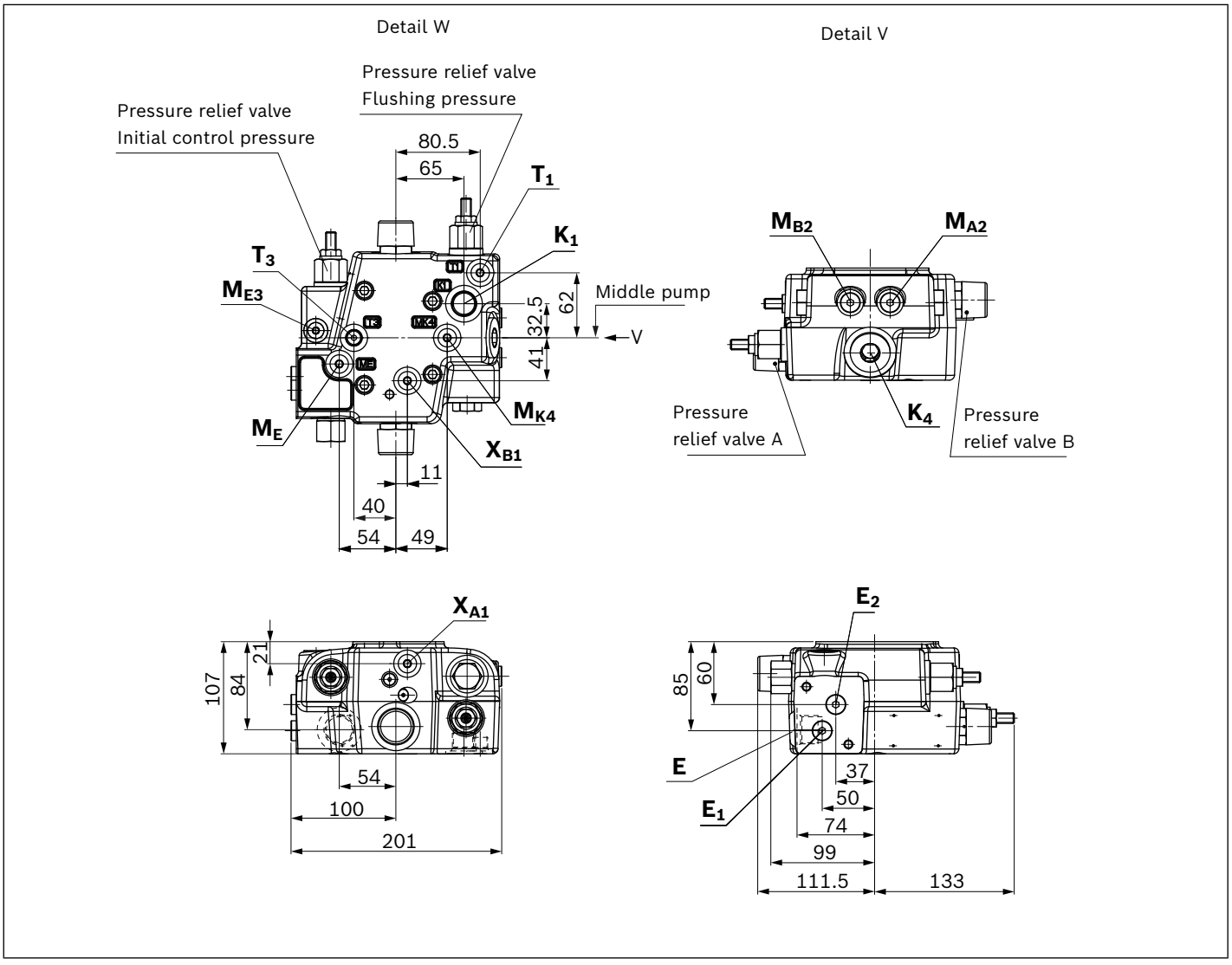
Dimensions of NG125 ATEX category II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X

EP.G – Remote-controlled electrohydraulic control with proportional solenoid and pressure control



For connection table, see page 24

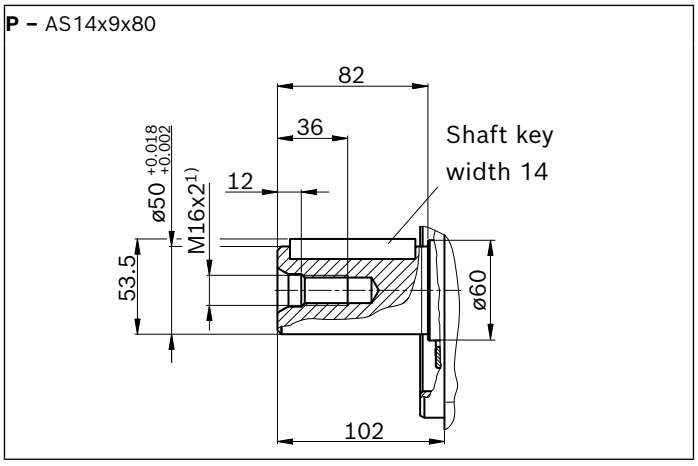
Valve block SDVB 16 (order item 13)



Hydraulic fluid; outlet in B_1 when:		
Drive direction	clockwise	Solenoid A
Swivel direction	counter-clockwise	
Hydraulic fluid; outlet in A when:		
Drive direction	clockwise	Solenoid B
Swivel direction	clockwise	

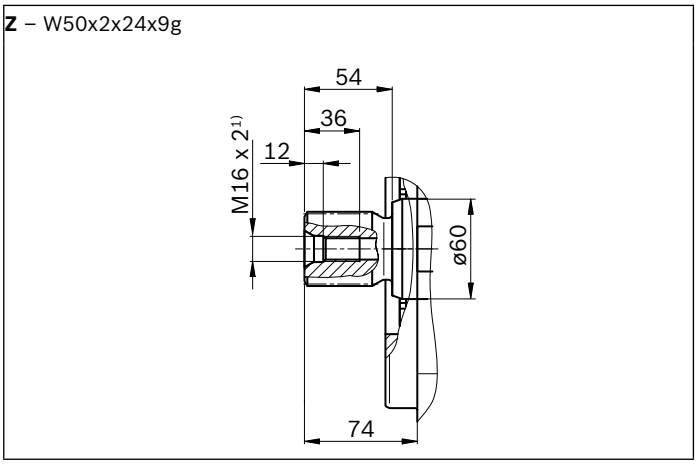
▼ **Parallel keyed shaft DIN 6885**

P – AS14x9x80



▼ **Splined shaft DIN 5480**

Z – W50x2x24x9g

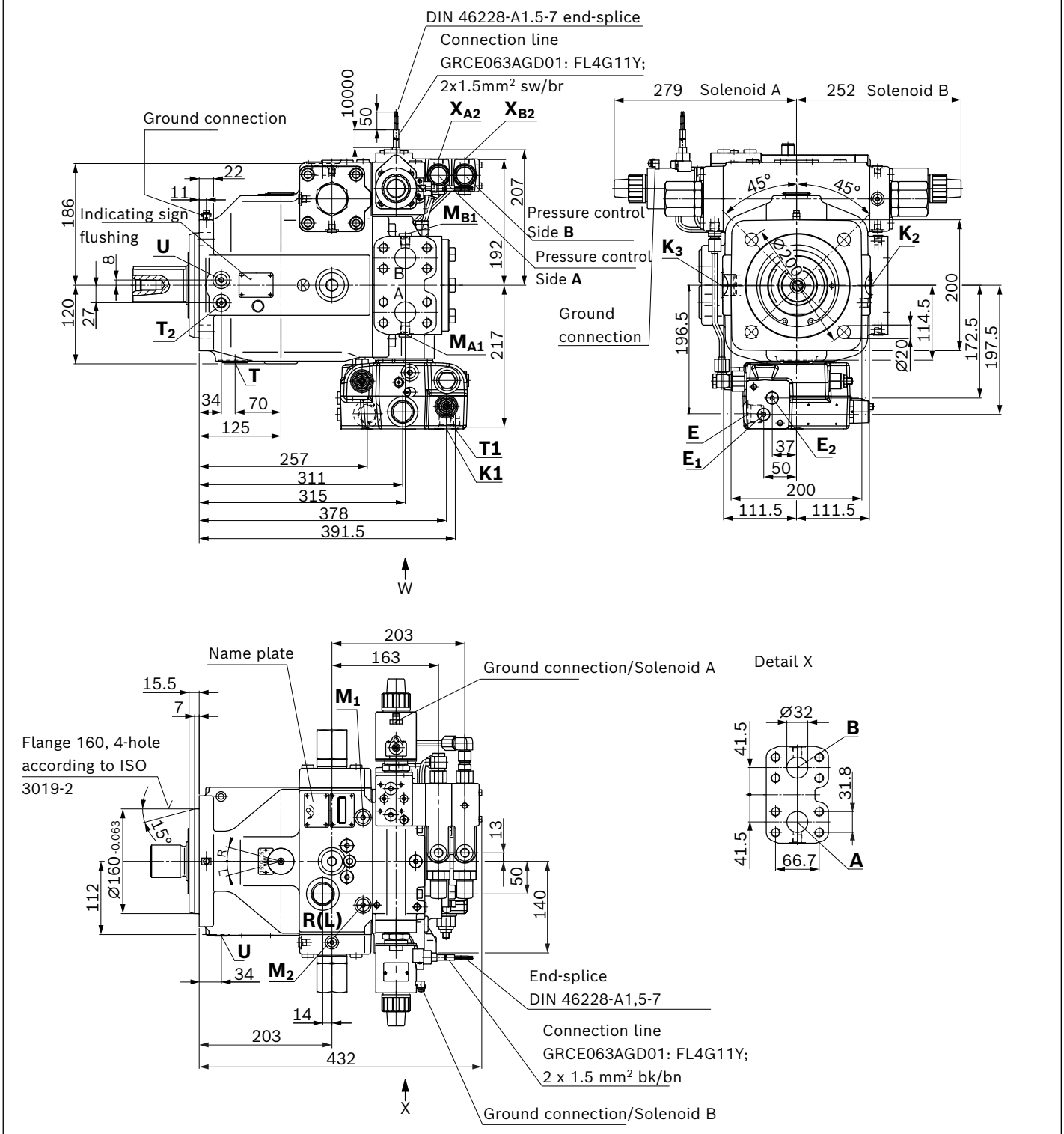


Ports		Standard	Size	$p_{max\ abs}$ [bar] 2)	State 6)
A, B_1	Working port (high-pressure series) Fastening thread **A**/**B**	SAE J518 DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
M_E	Boost pressure supply measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
E	Boost pressure supply (external)	DIN 13	M27 × 2; 16 deep	40	O
E_1	Filter, supply	DIN 13	M14 × 1.5; 12 deep	40	X
E_2	Filter, return	DIN 13	M14 × 1.5; 12 deep	40	X
M_{E3}	Boost pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
K_1	Flushing port	DIN 3852 4)	M22 × 1.5; 14 deep	4	O
K_2, K_3	Flushing port	DIN 3852 4)	M33 × 2; 18 deep	4	X
K_4	Accumulator port	DIN 3852 4)	M33 × 2; 18 deep	40	X
M_{K4}	Flushing pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
M_{A1}, M_{B1}	Pressure measuring port **A_1**, **B_1**	DIN 13	M14 × 1.5; 12 deep	400	X
M_{A2}, M_{B2}	Pressure measuring port **A_2**, **B_2**	DIN 13	M14 × 1.5; 12 deep	400	X
M_1, M_2	Control pressure measuring port	DIN 13 4)	M14 × 1.5; 12 deep	400	X
R(L)	Fluid filling, air bleeding	DIN 3852 4)	M33 × 2; 18 deep	4	O 3), 5)
T	Fluid drain	DIN 3852 4)	M33 × 2; 18 deep	4	X 5)
T_1	Pressure relief valve relief port	DIN 3852 4)	M14 × 1.5; 12 deep	4	X
T_2	Shaft seal relief port	DIN 3852 4)	M14 × 1.5; 12 deep	4	O 7)
T_3	Pressure relief valve relief port	DIN 3852 4)	M14 × 1.5; 12 deep	4	O
U	Flushing port (bearing flushing)	DIN 3852 4)	M14 × 1.5; 12 deep	7	**X**
X_{A2}, X_{B2}	Pilot pressure port for pressure controller	DIN 3852 4)	M14 × 1.5; 12 deep	400	O

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Only open port **R** for filling and air bleeding.
4) The countersink may be deeper than specified in the standard.
5) Depending on installation position, **T** or **R**(**L**) needs to be connected.
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Port **T_2** must be connected to the reservoir to relieve pressure on the double shaft seal.

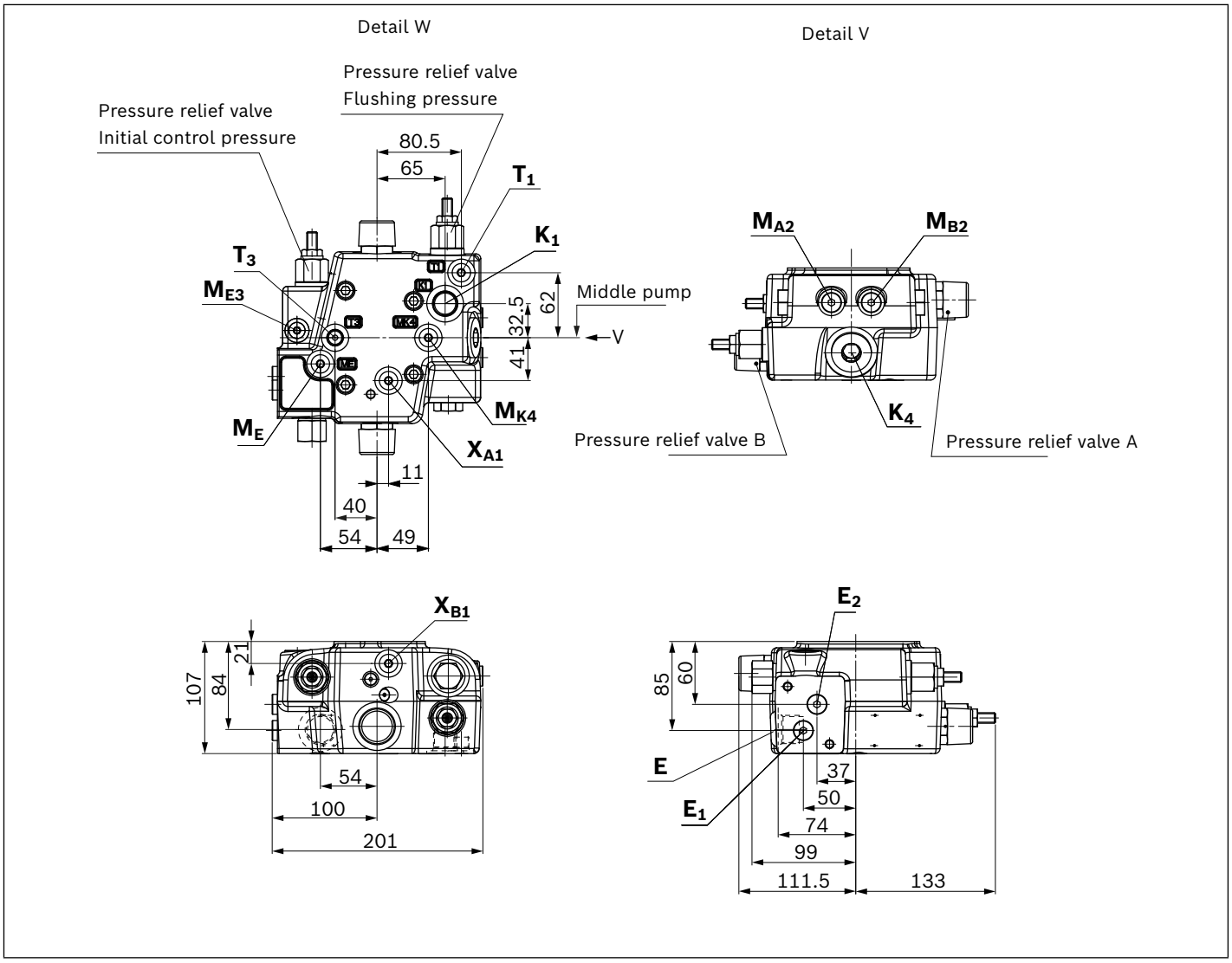
Dimensions of NG180 ATEX category II 2G Ex h IIC T4-T1 Gb X and II 3G Ex h IIC T4-T1 Gc X

EP.G – Remote-controlled electrohydraulic control with proportional solenoid and pressure control



For connection table, see page 28

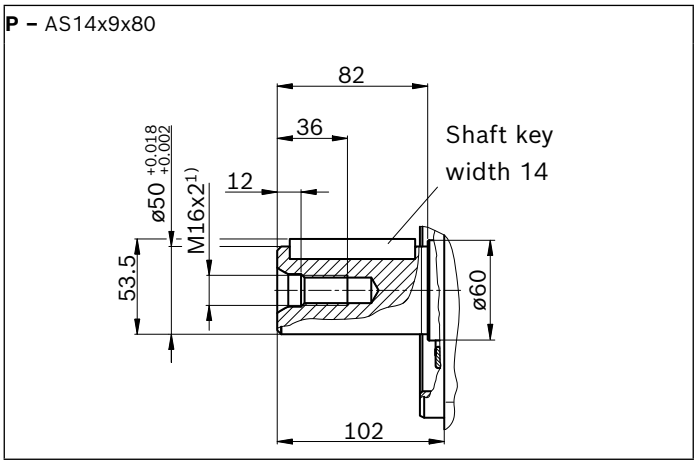
Valve block SDVB 16 (order item 13)



Hydraulic fluid; outlet in B_1 when:		
Drive direction	clockwise	Solenoid A
Swivel direction	counter-clockwise	
Hydraulic fluid; outlet in A when:		
Drive direction	clockwise	Solenoid B
Swivel direction	clockwise	

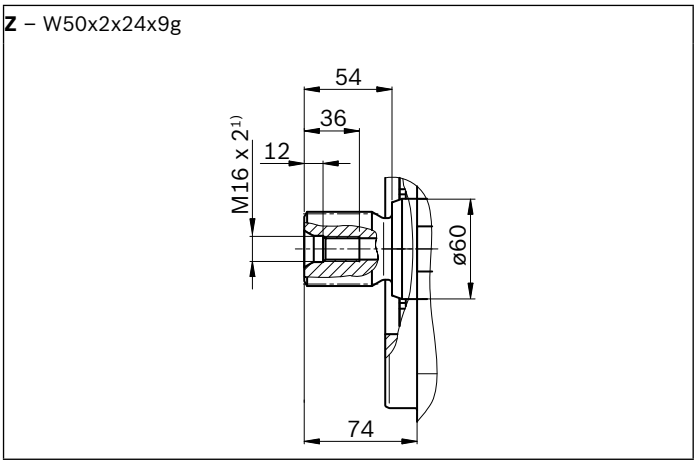
▼ **Parallel keyed shaft DIN 6885**

P – AS14x9x80



▼ **Splined shaft DIN 5480**

Z – W50x2x24x9g



Ports		Standard	Size	$p_{max\ abs}$ [bar][2]	State[6]
A, B_1	Working port (high-pressure series) Fastening thread **A**/**B**	SAE J518 DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
M_E	Boost pressure supply measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
E	Boost pressure supply (external)	DIN 13	M27 × 2; 16 deep	40	O
E_1	Filter, supply	DIN 13	M14 × 1.5; 12 deep	40	X
E_2	Filter, return	DIN 13	M14 × 1.5; 12 deep	40	X
M_{E3}	Boost pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
K_1	Flushing port	DIN 3852[4]	M22 × 1.5; 14 deep	4	O
K_2, K_3	Flushing port	DIN 3852[4]	M33 × 2; 18 deep	4	X
K_4	Accumulator port	DIN 3852[4]	M33 × 2; 18 deep	40	X
M_{K4}	Flushing pressure measuring port	DIN 13	M14 × 1.5; 12 deep	40	X
M_{A1}, M_{B1}	Pressure measuring port **A_1**, **B_1**	DIN 13	M14 × 1.5; 12 deep	400	X
M_{A2}, M_{B2}	Pressure measuring port **A_2**, **B_2**	DIN 13	M14 × 1.5; 12 deep	400	X
M_1, M_2	Control pressure measuring port	DIN 13[4]	M14 × 1.5; 12 deep	400	X
R(L)	Fluid filling, air bleeding	DIN 3852[4]	M33 × 2; 18 deep	4	O[3), 5)]
T	Fluid drain	DIN 3852[4]	M33 × 2; 18 deep	4	X[5)]
T_1	Pressure relief valve relief port	DIN 3852[4]	M14 × 1.5; 12 deep	4	X
T_2	Shaft seal relief port	DIN 3852[4]	M14 × 1.5; 12 deep	4	O[7)]
T_3	Pressure relief valve relief port	DIN 3852[4]	M14 × 1.5; 12 deep	4	O
U	Flushing port (bearing flushing)	DIN 3852[4]	M14 × 1.5; 12 deep	7	X
X_{A2}, X_{B2}	Pilot pressure port for pressure controller	DIN 3852[4]	M14 × 1.5; 12 deep	400	O

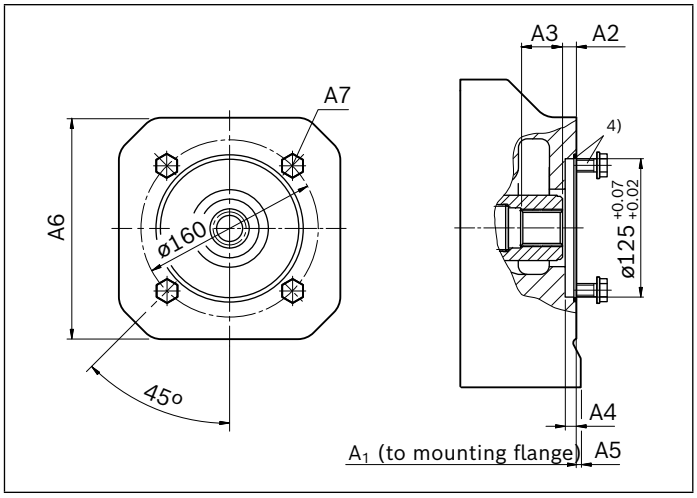
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Only open port **R** for filling and air bleeding.
4) The countersink may be deeper than specified in the standard.
5) Depending on installation position, **T** or **R**(**L**) needs to be connected.
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Port **T_2** must be connected to the reservoir to relieve pressure on the double shaft seal.

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
125-4	⌘	N32 × 2 × 14 × 8H	●	●	●	●	K31
140-4	⌘	N40 × 2 × 18 × 8H	–	●	●	●	K33

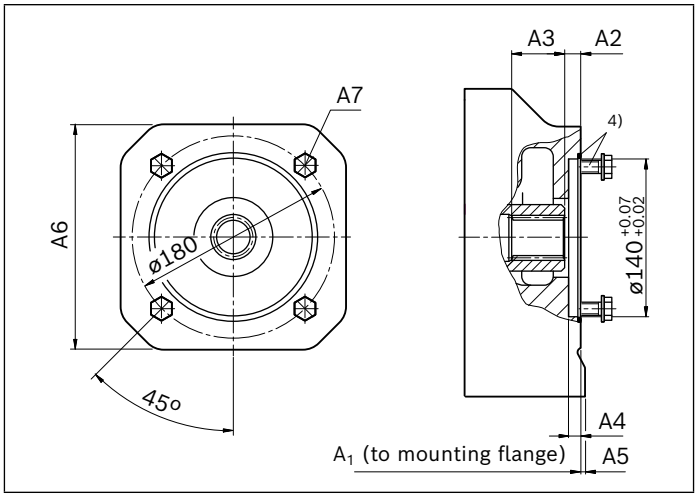
● = Available ○ = On request

▼ **125-4**



K31							
NG	A1	A2	A3	A4	A5	A6	A7[3]
40	288	12.5	41.4	9.5	–	–	M12; 25 deep
71	316	12.5	33.6	10	–	–	M12; 25 deep
125	373	12.5	42	9.5	–	–	M12; 25 deep
180	397	12.5	42	9.5	–	–	M12; 25 deep

▼ **140-4**



K33							
NG	A1	A2	A3	A4	A5	A6	A7[3]
71	316	11.5	44	9	–	–	M12; 25 deep
125	373	12.5	50	9.5	–	–	M12; 25 deep
180	397	12.5	43.8	9.5	–	–	M12; 25 deep

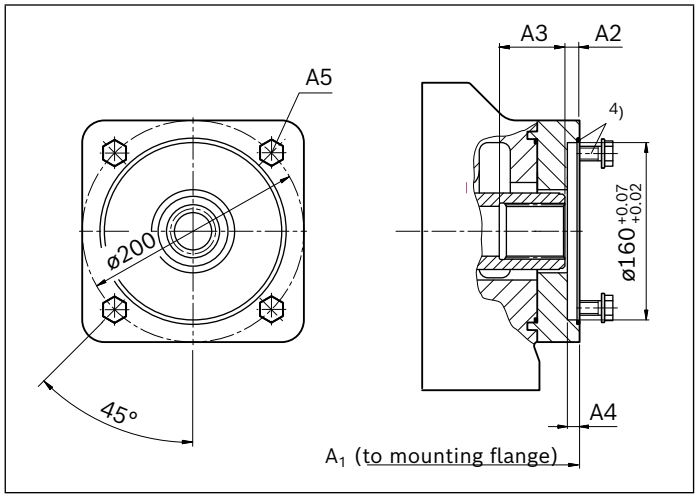
1) According to DIN 5480
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
160-4	⌘	N50 × 2 × 24 × 8H	–	–	●	●	K34

● = Available ○ = On request

▼ **160-4**



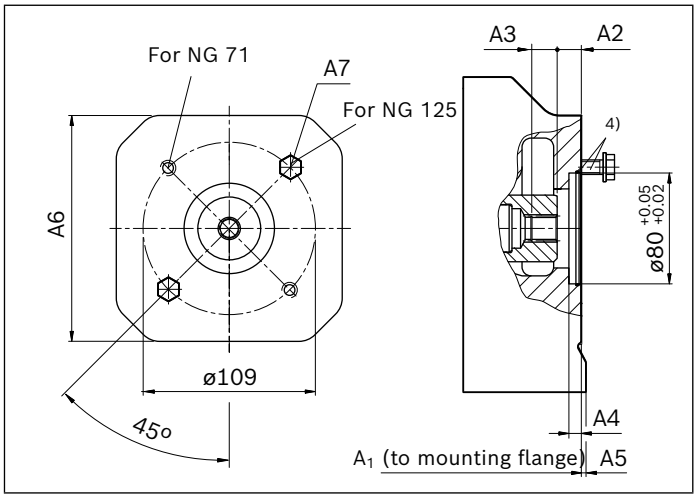
K34					
NG	A1	A2	A3	A4	A5[3]
125	379	12.5	58	10	M16; 30 deep
180	403	12.5	58	10	M16; 30 deep

1) According to DIN 5480
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
80-2		3/4in 11T 16/32DP	o	●	●	o	KB2

▼ **80-2**



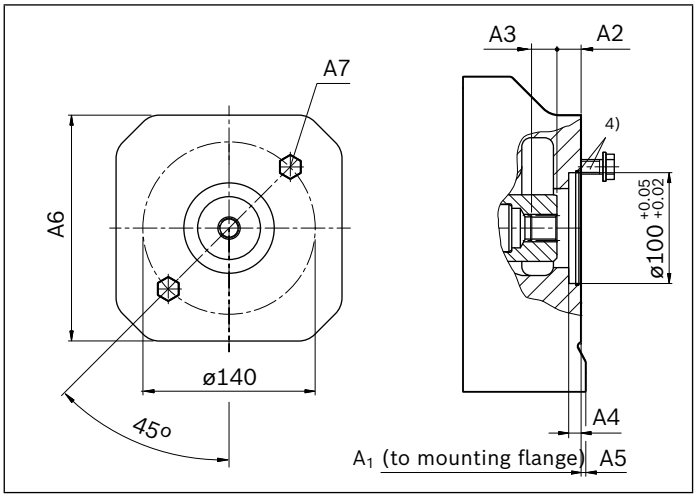
KB2							
NG	A1	A2	A3	A4	A5	A6	A7[3]
71	291	21.5	19	10	15	140	M10; 15 deep
125	379	24.2	20.5	10	–	–	M10; 12 deep

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
100-2		7/8in 13T 16/32DP	●	●	●	●	KB3
100-2		1 in 15T 16/32DP	○	●	●	●	KB4

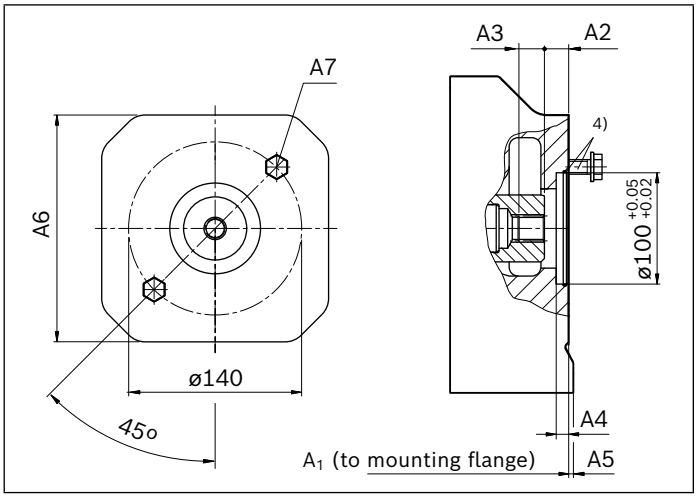
● = Available ○ = On request

▼ **100-2**



KB3							
NG	A1	A2	A3	A4	A5	A6	A7[3]
40	290	20.4	23	10	–	–	M12; 18 deep
71	316	20.4	23	9	–	–	M12; 18 deep
125	378	20.3	24.5	10	–	–	M12; 24 deep
180	371	20.5	23	10	–	–	M12; 15 deep

▼ **100-2**



KB4							
NG	A1	A2	A3	A4	A5	A6	A7[3]
71	316	20.8	27.5	8	–	–	M12; 24 deep
125	378	22.2	29	10	–	–	M12; 24 deep
180	371	21.8	27.9	10	–	–	M12; 15 deep

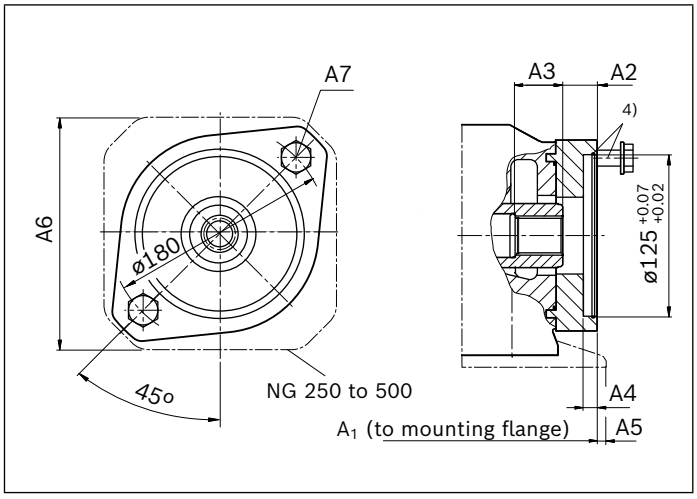
1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, Tolerance Class 5
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
125-2		1 1/4in 14T 12/24DP	–	●	●	●	KB5
125-2		1 1/2in 17T 12/24DP	–	–	●	●	KB6

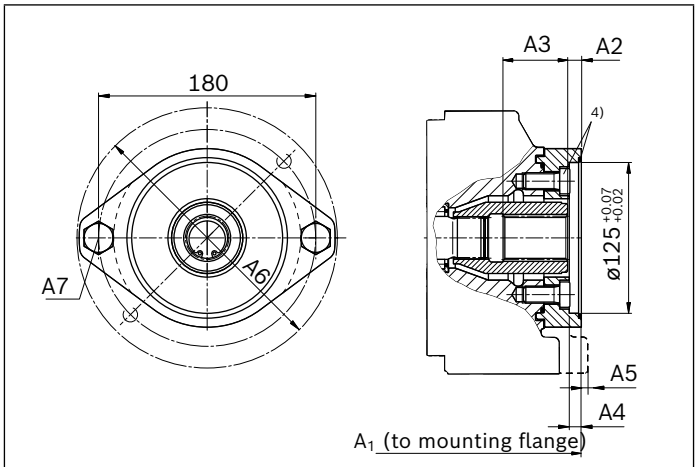
● = Available ○ = On request

▼ **125-2**



KB5							
NG	A1	A2	A3	A4	A5	A6	A7[3]
71	321	23.1	38.1	10	–	–	M16; 29 deep
125	378	23.7	38.1	9.5	–	–	M16; 24 deep
180	402	23.7	38.1	9.5	–	–	M16; 24 deep

▼ **125-2**



KB6							
NG	A1	A2	A3	A4	A5	A6	A7[3]
125	378	11.4	54	9.5	–	–	M16; 24 deep
180	402	11.4	54	9.5	–	–	M16; 24 deep

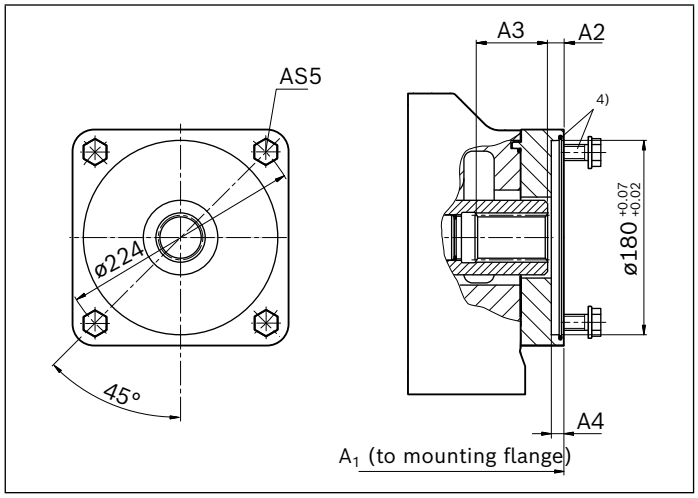
1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, Tolerance Class 5
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

Flange ISO 3019-2 (metric)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
180-4	⌘	1 3/4in 13T 8/16DP	–	–	●	●	KB7

● = Available ○ = On request

▼ **180-4**



KB7					
NG	A1	A2	A3	A4	A5[3]
125	395	10.5	45	10	M16; 30 deep
180	419	10.5	45	10	M16; 30 deep

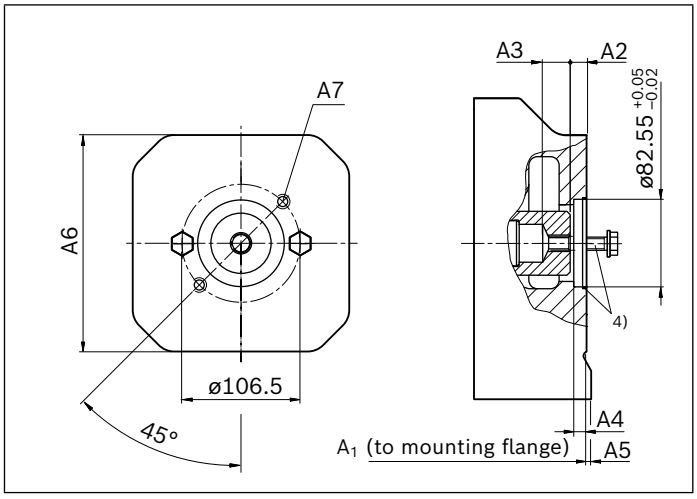
1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, Tolerance Class 5
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)		Hub for splined shaft[1]		Availability across sizes				Code
Diameter	Mounting[2]	Diameter		40	71	125	180	
82-2 (A)	⚷, ⊷	5/8in	9T 16/32DP	●	●	●	●	K01
82-2 (A-B)	⚷, ⊷	3/4in	11T 16/32DP	○	○	○	○	K52

● = Available ○ = On request

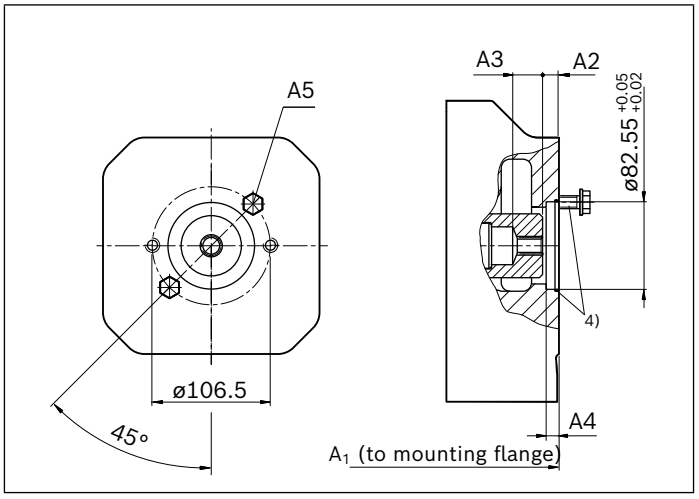
▼ **82-2**



K01 (16-4 (A))

NG	A1	A2	A3	A4	A5	A6	A7[3]
40	263	10.5	25.8	10	18	130	M10; 15 deep
71	291	10.5	25.4	10	15	140	M10; 15 deep
125	347	10.3	28	10	13	150	M10; 15 deep
180	371	10.3	28	10	–	–	M10; 15 deep

▼ **82-2**



K52 (19-4 (A-B))

NG	A1	A2	A3	A4	A5[3]
180	371	21.4	19.1	10	M10; 15 deep

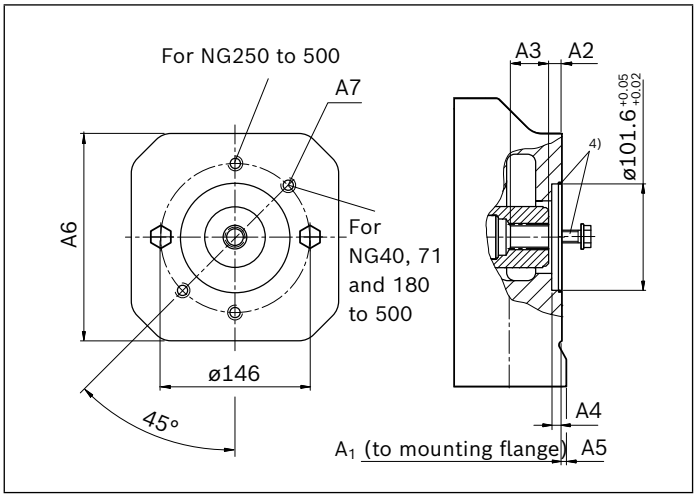
1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, Tolerance Class 5
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)		Hub for splined shaft[1]		Availability across sizes				Code
Diameter	Mounting[2]	Diameter		40	71	125	180	
101-2 (B)		7/8in	13T 16/32DP	●	●	●	●	K68
101-2 (B-B)		1 in	15T 16/32DP	●	●	●	●	K04

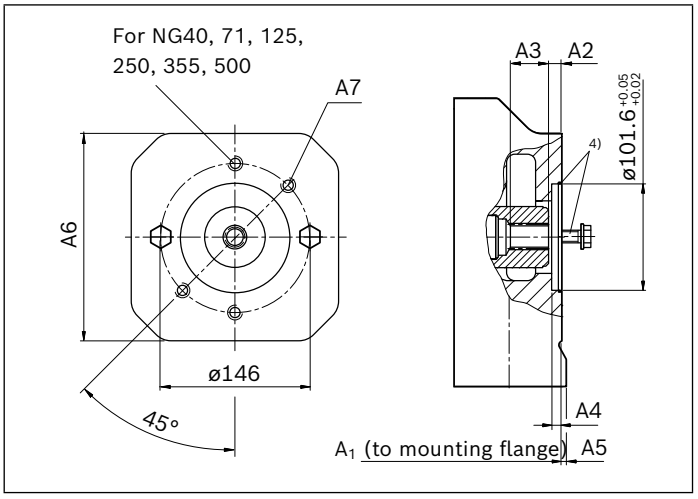
● = Available ○ = On request

▼ **101-2**



K68 (22-4 (B))							
NG	A1	A2	A3	A4	A5	A6	A7[3]
40	290	20.4	23	10	–	–	M12; 18 deep
71	322	20.5	23	10	–	–	M12; 30 deep
125	347	20.5	23	10	16	150	M12; 15 deep
180	371	20.5	23	10	–	–	M12; 16 deep

▼ **101-2**



K04 (25-4 (B-B))							
NG	A1	A2	A3	A4	A5	A6	A7[3]
40	290	20.8	27.5	10	–	–	M12; 20 deep
71	322	20	29.4	10	–	–	M12; 30 deep
125	379	23.7	29	10	–	–	M12; 30 deep
180	371	21.8	27.9	10	–	–	M12; 16 deep

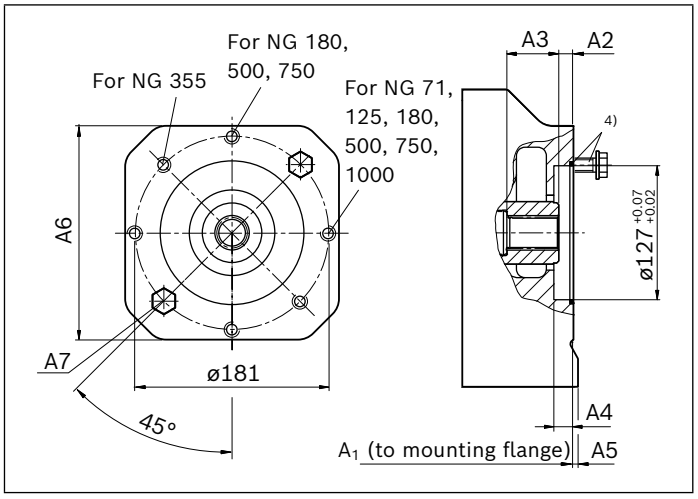
1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, Tolerance Class 5
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

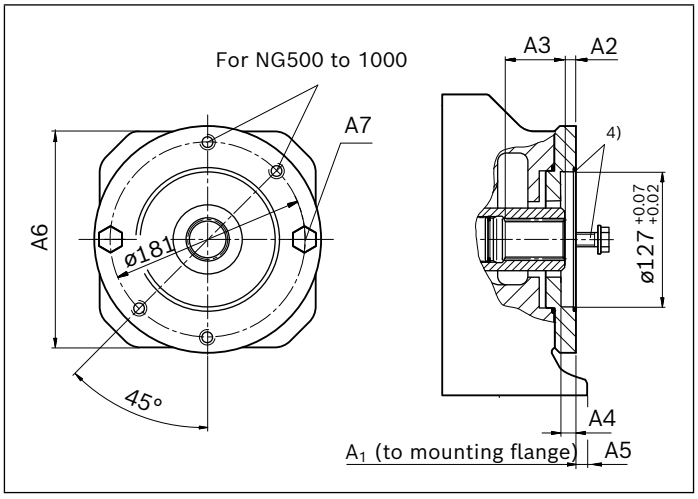
Flange ISO 3019-1 (SAE J744)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
127-2 (C)		1 1/4in 14T 12/24DP	–	●	●	●	K07
127-2 (C-C)		1 1/2in 17T 12/24DP	–	–	●	●	K24

● = Available ○ = On request

▼ **127-2**



▼ **127-2**



K07 (32-4 (C))

NG	A1	A2	A3	A4	A5	A6	A7[3]
71	321	23	38	13	–	–	M16; 30 deep
125	377	22.7	37.5	13	–	–	M16; 28 deep
180	401	22.7	37.5	13	–	–	M16; 28 deep

K24 (38-4 (C-C))

NG	A1	A2	A3	A4	A5	A6	A7[3]
125	377	10.4	54	13	–	–	M16; 28 deep
180	401	10.4	54	13	–	–	M16; 28 deep

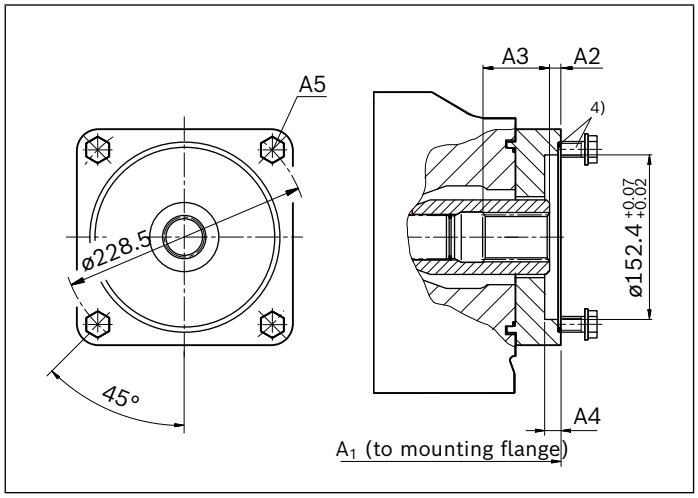
1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, Tolerance Class 5
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Dimensions for through drives

Flange ISO 3019-1 (SAE J744)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	Mounting[2]	Diameter	40	71	125	180	
152-4 (B)	⌘	1 3/4in 13T 8/16DP	–	–	●	●	K17

● = Available ○ = On request

▼ **152-4**



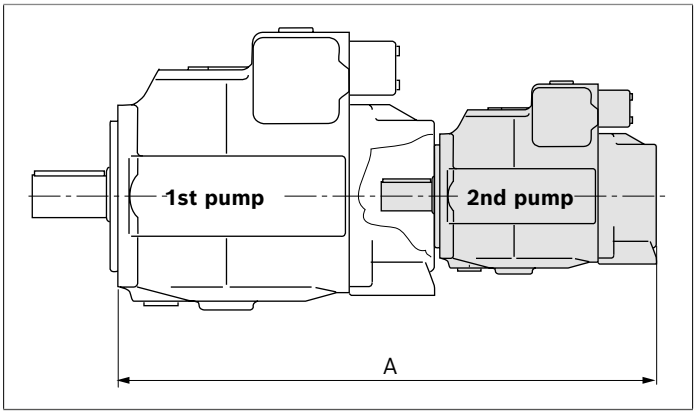
K17 (44-4 (D))					
NG	**A1**	**A2**	**A3**	**A4**	**A5**[3]
125	382	10.4	62	13	M16; 30 deep
180	406	10.4	62	13	M16; 30 deep

1) In accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, Tolerance Class 5
2) Mounting holes pattern viewed on through drive with control at top.
3) Thread according to DIN 13; observe the maximum tightening torques in the instruction manual.
4) O-ring and mounting bolts included in delivery.

Overview of mounting options

Through drive[1)]			**Mounting options – 2nd pump**	
Flange ISO 3019-2 (metric)	**Hub for splined shaft**	**Code**	**A4VSO A4VSG NG (shaft)**	**A10V(S)O/3x NG (shaft)**
80-2	3/4in	KB2	–	18 (S)
100-2	7/8in	KB3	–	28 (S)
	1 in	KB4	–	45 (S)
125-2	1 1/4in	KB5	–	71, 88 (S)
	1 1/2in	KB6	–	100 (S)
125-4	W32x2x14x9g	K31	40 (Z)	–
140-4	W40x2x18x9g	K33	71 (Z)	–
160-4	W50x2x24x9g	K34	125 (Z) 180 (Z)	–
	1 1/4in	KB8	–	71, 88 (S)
180-4	1 3/4in	KB7	–	140, 180 (S)
	1 1/2in	KB9	–	100 (S)
Flange ISO 3019-1 (SAE J744)	**Hub for splined shaft**	**Code**	**A4VSO A4VSG NG (shaft)**	**A10V(S)O/3x NG (shaft)**
82-2 (A)	5/8in	K01	–	–
	3/4in	K52	–	18 (S)
101-2 (B)	7/8in	K68	–	28 (S)
	1 in	K04	–	45 (S)
127-2 (C)	1 1/4in	K07	–	71, 88 (S)
	1 1/2in	K24	–	100 (S)
152-4 (D)	1 3/4in	K17	–	140, 180 (S)

Combination pumps A4VSG + A4VSG



Total length A

A4VSG (1. pump)	**A4VSG (2. pump)**			
	NG40	**NG71**	**NG125**	**NG180**
NG40	570	–	–	–
NG71	598	622	–	–
NG125	655	679	743	–
NG180	679	703	766	778

Combination pumps A4VSG + A4VSO

Total length A

A4VSG (1. pump)	**A4VSO (2. pump)**			
	NG40	**NG71**	**NG125**	**NG180**
NG40	554	–	–	–
NG71	582	611	–	–
NG125	639	668	735	–
NG180	663	692	758	778

By using combination pumps, it is possible to have independent circuits without the need for splitter gearboxes.
When ordering combination pumps, the type designations of the 1st and 2nd must be connected with a "**+**" and are combined into one part number. Each single pump should be ordered according to type code.

Notice

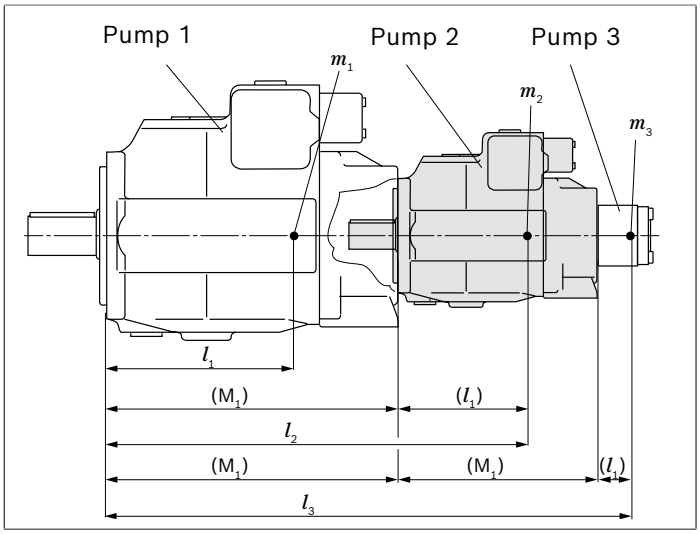
- The combination pump type code is shown in shortened form in the order confirmation.
  Example:
  A4VSG 125 EO1/30R+A4VSG 71 HM1/10R
- Each through drive is plugged with a **non–pressure-resistant** cover. This means the units must be sealed with a pressure-resistant cover before commissioning. Through drives can also be ordered with a pressure-resistant cover. Please specify in plain text.

Order example:
A4VSG 125 EP1/30R-PPB10K33+
A4VSG 71 HD1/10R-PZB10N00N
A tandem pump, with two pumps of equal size, is permissible without additional supports, assuming that the dynamic mass acceleration does not exceed maximum 10 g (= 98.1 m/s²).
For combination pumps consisting of more than two pumps, the mounting flange must be calculated for the permissible mass torque.

Notices

- Collisions with other attachment pumps may occur when controlling the combination pumps. Please check this using the appropriate data sheets for the individual pumps and controls, or contact us.
- All attachment pumps must match the ATEX classification for the application in question.

For information on the piping of combination pumps, see page page 41.



m_1, m_2, m_3	Weight of pump	[kg]
l_1, l_2, l_3	Distance from center of gravity	[mm]
$T_m = (m_1 \bullet l_1 + m_2 \bullet l_2 + m_3 \bullet l_3) \bullet \frac{1}{102}$		[Nm]

Calculation for multiple pumps

l_1	=	Front pump distance from center of gravity (values from "Permissible moments of inertia" table)
l_2	=	Dimension "M1" from through drive drawings (page 29 to page 38) + l_1 of the 2nd pump
l_3	=	Dimension "M1" from through drive drawings (page 29 to page 38) of the 1st pump + "M1" of the 2nd pump + l_1 of the 3rd pump

Permissible moments of inertia

NG			40	71	125	180
static	T_m	Nm	1800	2000	4200	4200
dynamic at 10 g (98.1 m/s²)	T_m	Nm	180	200	420	420
Weight	m	kg	47	60	100	114
Distance from center of gravity	l_1	mm	120	140	170	180

Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines. Particularly in the installation position “drive shaft upwards”, filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.

The leakage in the housing area should be directed to the reservoir via the highest drain port (**T**, **R(L)**, $\mathbf{K}_2$, $\mathbf{K}_3$).

For combination pumps, the leakage must be drained off at each single pump.

If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating conditions, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.

To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.

In all operating conditions, the suction and drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height h_S results from the total pressure loss. However, it must not be higher than $h_{S\ max}$ = 800 mm. The minimum suction pressure at port **S** must also not fall below 0.8 bar abs. during operation and during a cold start.

Notice

- In certain installation positions, an influence on the adjustment or control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in actuating time.
- All attachment pumps must match the ATEX classification for the application in question.

Installation position

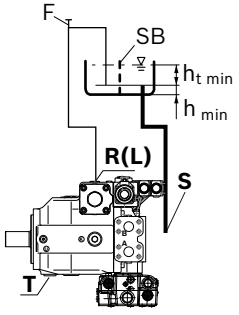
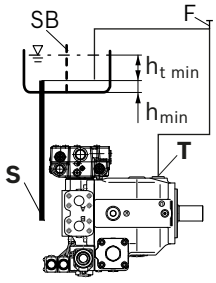
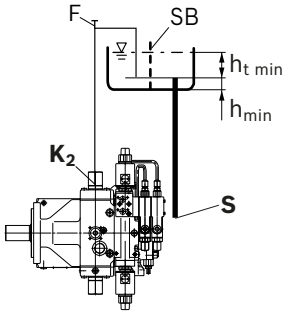
See the following examples **1** to **12** on the following pages. Further installation positions are available upon request.

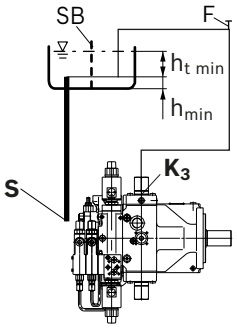
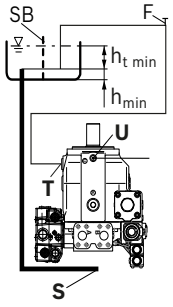
Recommended installation position: **1** and **2**

Installation instructions

Below-reservoir installation (standard)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

Installation position	Air bleed	Filling
1 	**R(L)**	**R(L)**
2 	**T**	**T**
3 	**K_2**	**K_2**

Installation position	Air bleed	Filling
4 	**K_3**	**K_3**
5 	**T**	**T** Bearing flushing at port **U** required. For details, see page 7

Key	
L	Filling / Air bleeding
S	Suction port
T	Drain port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to reservoir bottom (100 mm)
$h_{ES\ min}$	Minimum height required to prevent axial piston unit from draining (25 mm)
$h_{S\ max}$	Maximum permissible suction height (800 mm)

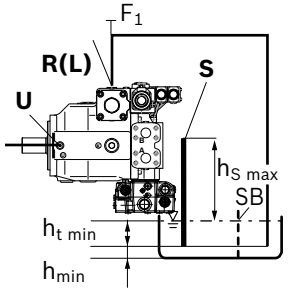
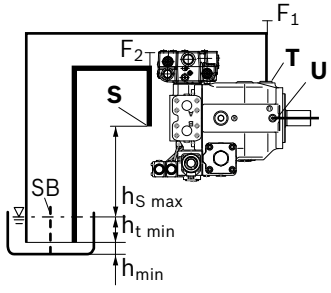
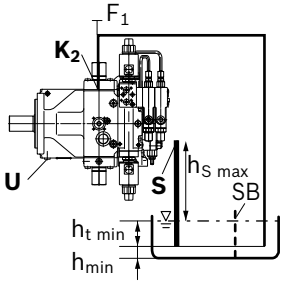
Above-reservoir installation

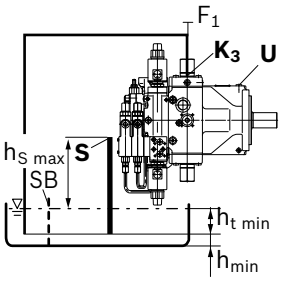
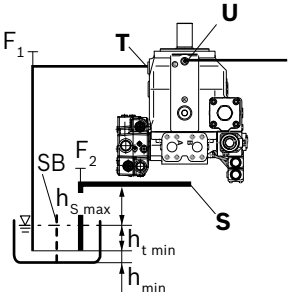
Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. To prevent the axial piston unit from draining, a height difference $h_{ES\ min}$ of minimum 25 mm at port R(L), **T** is required in Position 12. Observe the maximum permissible suction height $h_{S\ max}$ = 800mm.

Notice

Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

- With above-reservoir installation, only operate the axial piston unit with bearing flushing.

Installation position	Air bleed	Filling
6 	**R(L)**	**R(L)** (F)
7 	**T**	**T** (F)
8 	**K2**	**K2** (F)

Installation position	Air bleed	Filling
9 	**K3**	**K3** (F)
10 	**T**	**T** (F)

Project planning notes

- The A4VSG axial piston variable pump is designed to be used in closed circuit.
- The project planning, assembly and commissioning of the axial piston unit require the involvement of qualified skilled persons.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
  More information on the products can be found in the data sheets listed on page 1.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- The characteristic curve may also shift due to the dither frequency or control electronics.
- Preservation: Our axial piston units are supplied as standard with preservative protection for a maximum of 12 months. If longer preservation is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, which can be found in data sheet 90312 or in the instruction manual.
- Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Use of the recommended direct current (DC) on the electromagnet does not produce any electromagnetic interference (EMI) nor is the electromagnet influenced by EMI. Potential electromagnetic interference (EMI) exists if the solenoid is energized with a modulated direct current (e.g. PWM signal). The machine manufacturer should conduct appropriate tests and take appropriate measures to ensure that other components or operators (e.g. with a pacemaker) are not affected by this potentiality.
- Pressure controllers are not safeguards against pressure overload. Be sure to add a pressure relief valve to the hydraulic system.
- For drives that are operated for a long period with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency ×9). This can be prevented with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- Working ports:
  - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
  - The working ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of burning on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are appropriately implemented.

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